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OCTOBER, 1956

METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

FOUNDED 1903

OCT 23 1956

Leveling Nickel

Recent Developments in Surface Refinement

Cleaning Metals and Alloys

Soils, Their Sources and Removal

Barrel Plating Equipment

Construction Features Which Determine Choice

Surface Treatment and Finishing of

Light Metals

Properties of Anodic Coatings

Finishing Pointers

Bond and Adhesion

Science for Electroplaters

Electrolytes

Complete Contents Page 50A

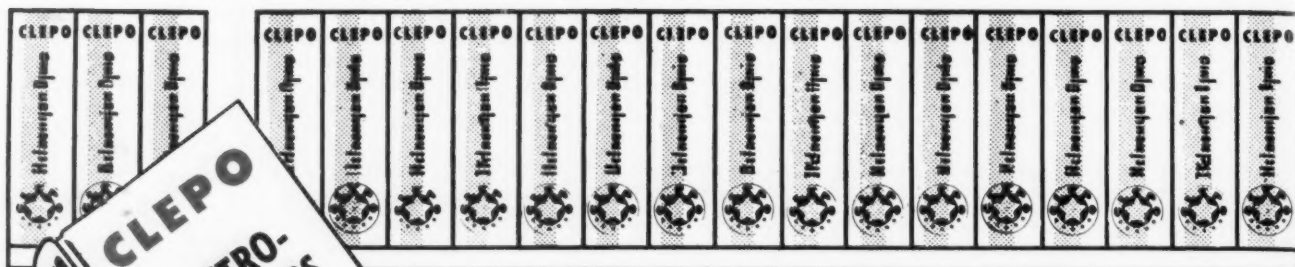


WESTWOOD,
N. J.

WHERE PLATERS
AND FINISHERS
LOOK FOR INFORMATION
FINISHING PUBLICATIONS, INC.

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LIBRARY OF CLEPO SERVICE



★ **1-C**
for Brass
(direct current)

★ **42-S**
for Nickel
(direct current)

★ **166**
for Steel
(reverse or
direct current)

★ **50-K**
for Zinc Base
Die Castings
(reverse current)

★ **144**
for Steel
(reverse or
direct current)

★ **51-H**
for Zinc Base
Die Castings
(direct current)

★ **122**
for Brass
(direct current)

★ **43-R**
for Copper
(reverse current)



ELECTROCLEANERS
that do a
Superior Job

★ **166-C**
for Steel
(reverse or
direct current)

★ **177**
for Steel
(exceptionally difficult
soil removal)
(reverse current)

★ **230-N**
for Nickel
(tolerant to
chromic acid)
(direct current)

Do you need an electrocleaner for a specific job where the type of soil, limited time cycle, and wide range of current densities due to shape of the work, call for a highly specialized material? We can supply it.

On the other hand if your operations permit the use of a general utility cleaner for two or more metals, we can supply that, too.

While a multipurpose electrocleaner will give excellent results so far as general shop use is concerned, it may not be the best for any given job where a limited time cycle, special soil problem or other local condition demands peak performance.

Whether simple multipurpose or highly specific, CLEPO has the proper Electrocleaner. If our Field Service man can be of help in studying the problem and in selecting the cleaner, he is at your command. Call us, if your trouble is pressing and we'll expedite matters.

Electrocleaners are but one phase of our broad service to your industry. For more than twenty five years we have developed and progressively improved upon an extensive line of quality cleaners, strippers, aluminum finishes, tumbling barrel chemicals, deburring materials, etc. CLEPO can serve you well.

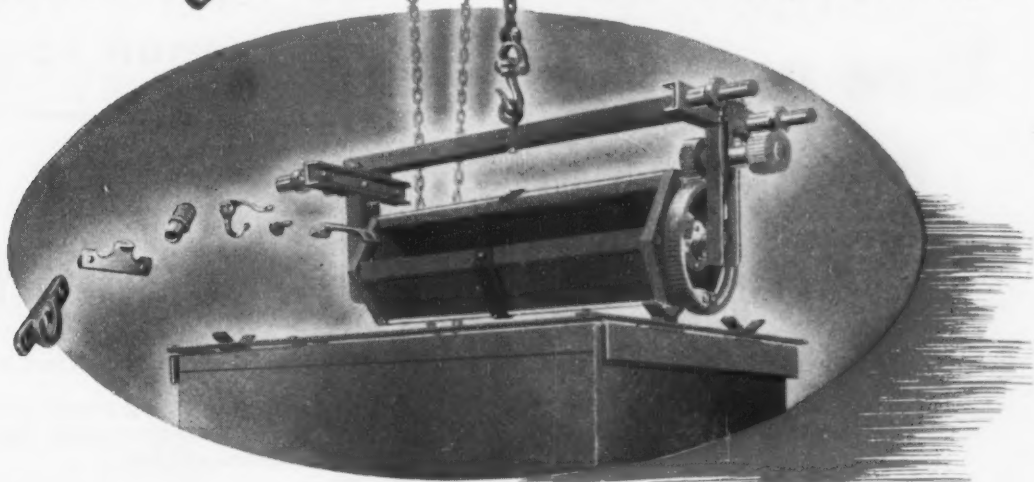
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Chemical Company Inc.

538 FOREST STREET, KEARNY, N. J.

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use

ENTHONE

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- ☒ Skilled chemists work out your plating cycles and aid you in the plant.
- ☒ Alumon is a quality product of high purity materials and is exactly formulated to insure consistency of result.

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Metal Finishing Processes • Electroplating Chemicals

NEW OAKITE CLEANERS
GIVE YOU MORE FOR YOUR
PAINT-PREPARATION DOLLAR

Here are 6 ways to end pre-paint metal-cleaning troubles

Does your trouble chart show that you need better cleaners, strippers or surface conditioners?

- | | |
|---|---|
| <input type="checkbox"/> Cleaning solution foams excessively in spray washing machine. See 1 below. | <input type="checkbox"/> Zinc phosphating process too difficult to control—requires too many titrations, too many additions, etc. See 4. |
| <input type="checkbox"/> Streaky discolorations or powdery residues cling to surface of steel parts being stripped for repainting. See 2. | <input type="checkbox"/> Iron phosphating process doesn't show good results in salt spray tests. See 5. |
| <input type="checkbox"/> Aluminum parts are severely etched while being stripped of zinc chromate primer or other finishes. See 3. | <input type="checkbox"/> Too many operations—cleaning, pickling, neutralizing, etc.—are needed to prepare steel that does not require phosphating before painting. See 6. |

Here are brief descriptions of new Oakite materials designed to end these particular troubles:

1. For a spray washing solution that does not foam at high pressure, try Oakite Composition No. 161. Does not attack aluminum.
2. For stripping pigmented paint, phosphate coatings and undercoat rust *in one operation*, try Oakite Rustripper.
3. For safe, thorough stripping of aluminum, try Oakite Stripper No. 110.
4. For a zinc phosphating process that is truly easy to control, try new Oakite CrysCoat SW. No accelerators, starters or toners. Only one material used for make-up and up-keep.
5. For salt spray results far beyond the capacity of ordinary phosphating processes, try new Oakite CrysCoat No. 89.
6. For *one-operation* removal of rust, heat scale, welding residues and light soil together with good preparation for painting, try Oakite Compound No. 131. Inhibited against attack on steel.

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| <input type="checkbox"/> Oakite Rustripper | <input type="checkbox"/> Oakite CrysCoat No. 89 |
| <input type="checkbox"/> Oakite Stripper No. 110 | <input type="checkbox"/> Oakite Compound No. 131 |

Name

Company

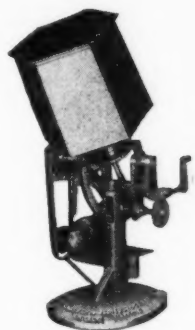
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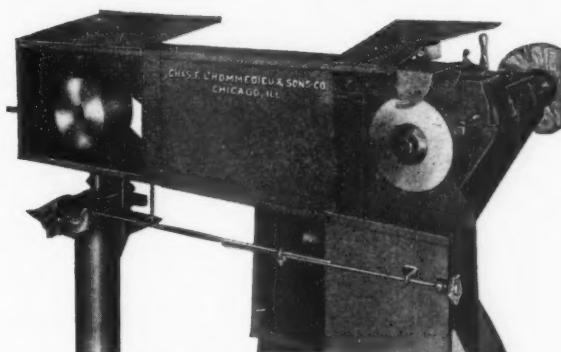
USE "RELIANCE" PRODUCTS FOR

ECONOMY : EFFICIENCY : DEPENDABILITY

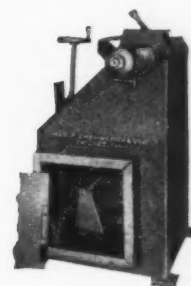
WRITE FOR FURTHER DETAILS



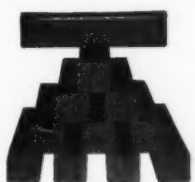
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STANDARD SIZE
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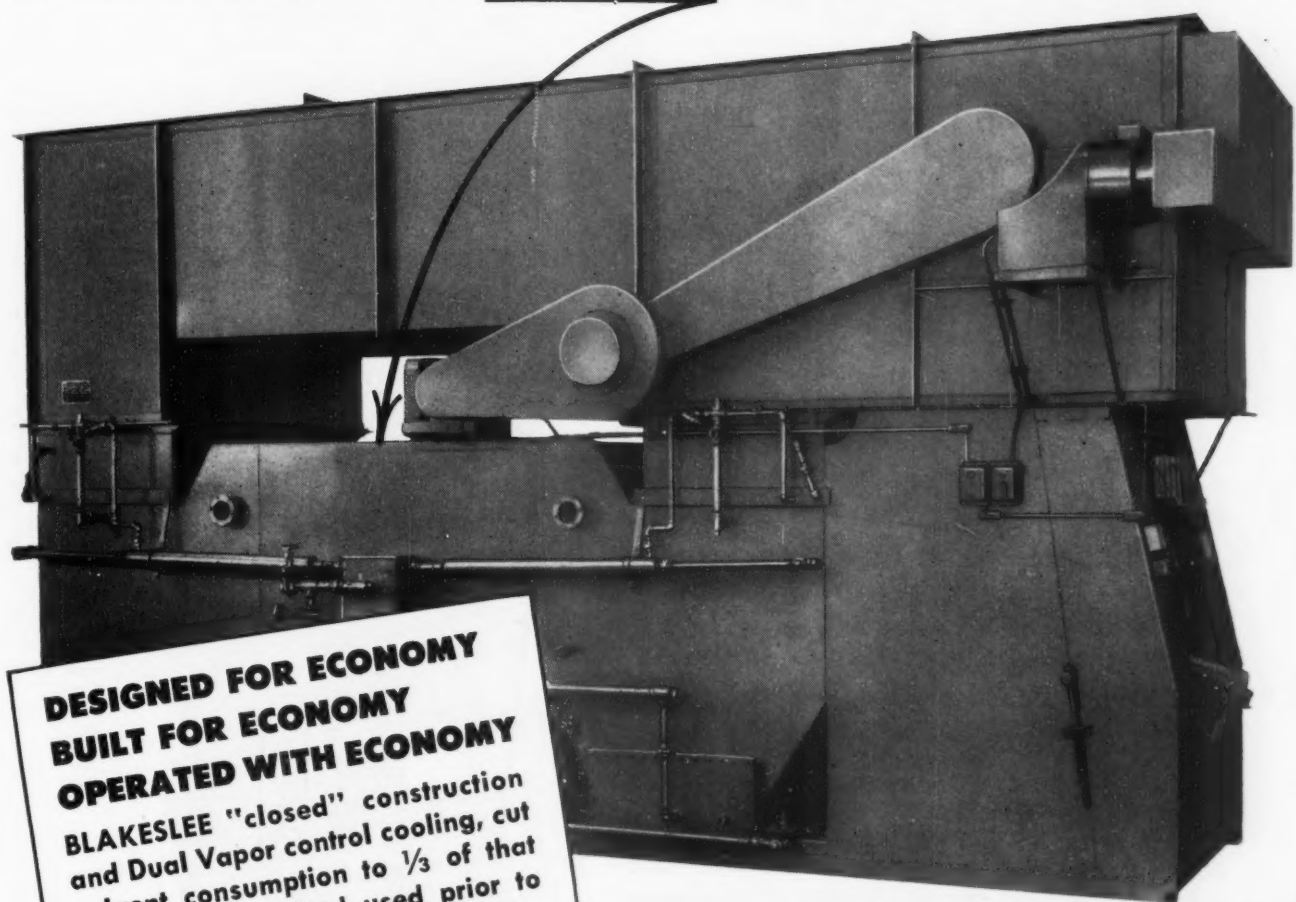


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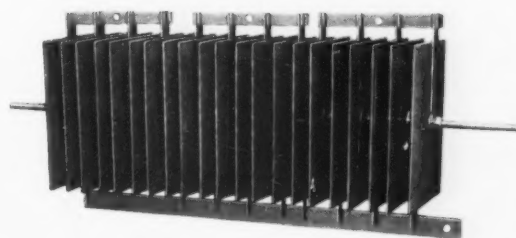
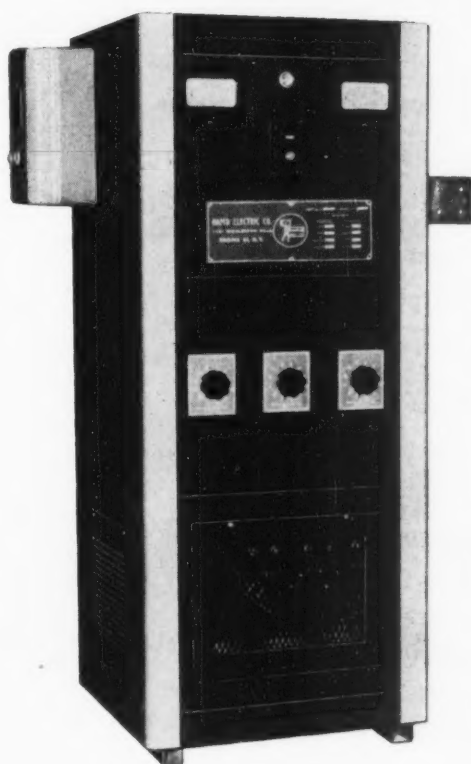
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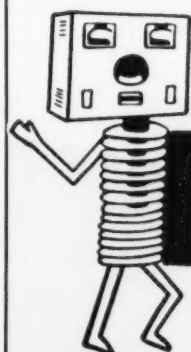
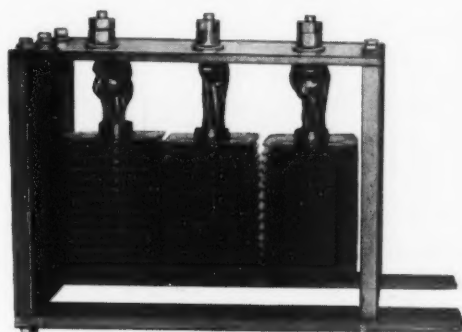
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For extreme accuracy in masking parts for all plating cycles.

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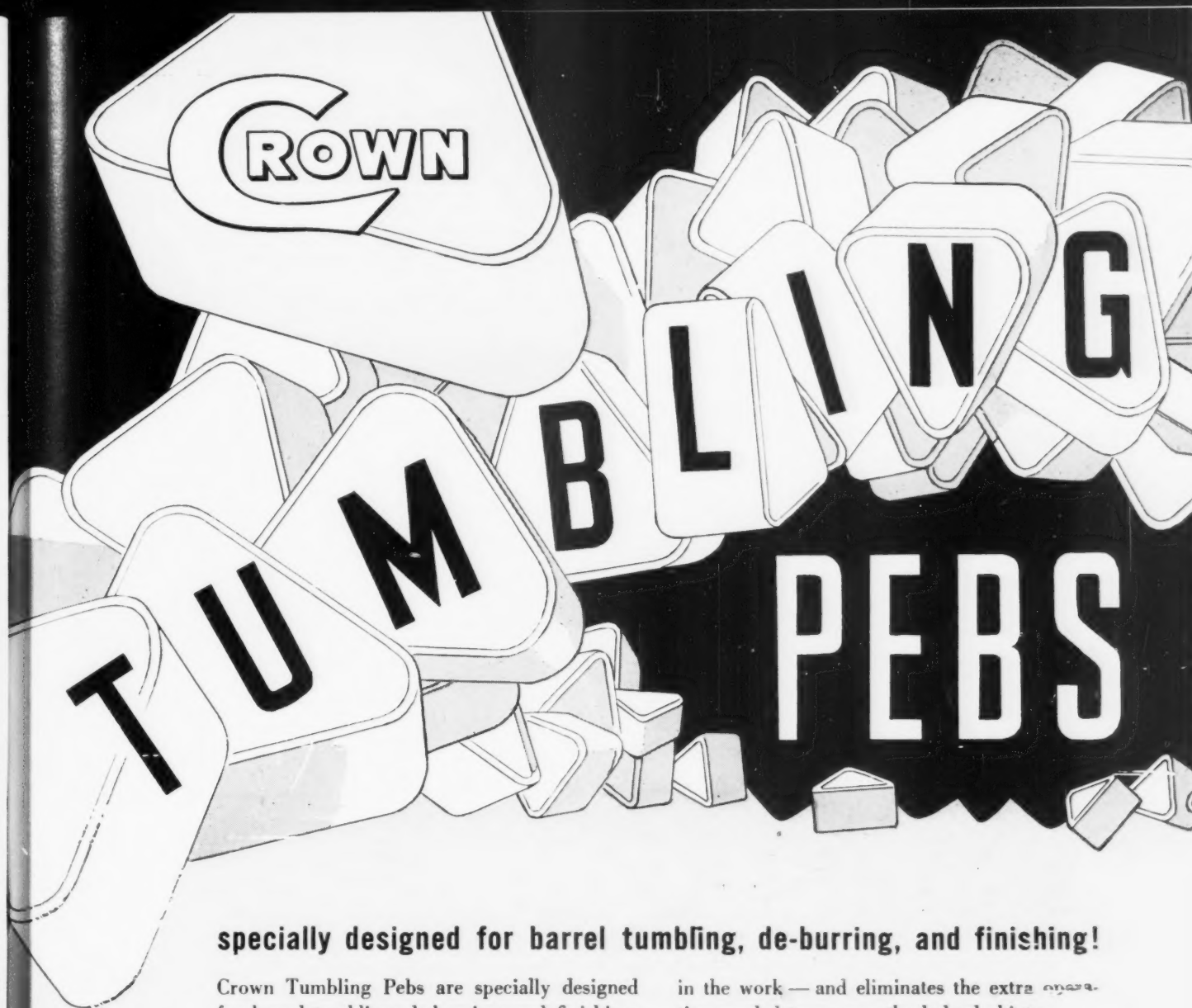
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MICHIGAN CHROME and Chemical Company

8615 Grinnell Avenue • Detroit 13, Michigan





specially designed for barrel tumbling, de-burring, and finishing!

Crown Tumbling Pebs are specially designed for barrel tumbling, de-burring, and finishing. They are manufactured of a tough, white ceramic, uniform in size and shape, and available in a variety of sizes. Crown Pebs have many advantages in tumbling operations and are widely used for de-burring and similar tumbling processes in many types of barrel tumbling equipment.

Eliminates lodging in holes . . . Crown Pebs eliminate the "lodgement" hazard of random shaped chips. Just select the proper size, and the uniform size and shape of the Crown Pebs eliminates lodging in holes, recesses, and slots

in the work — and eliminates the extra operation needed to remove the lodged chips.

Longer life . . . The tough wear resistant ceramics in Crown Pebs give a service life several times longer than either natural stones or the aluminum oxide type of tumbling chips.

Crown Tumbling Pebs do not cut as rapidly as random shaped natural stones and aluminum oxide chips, but the uniform results and their much longer life make them very valuable in many tumbling and de-burring operations.

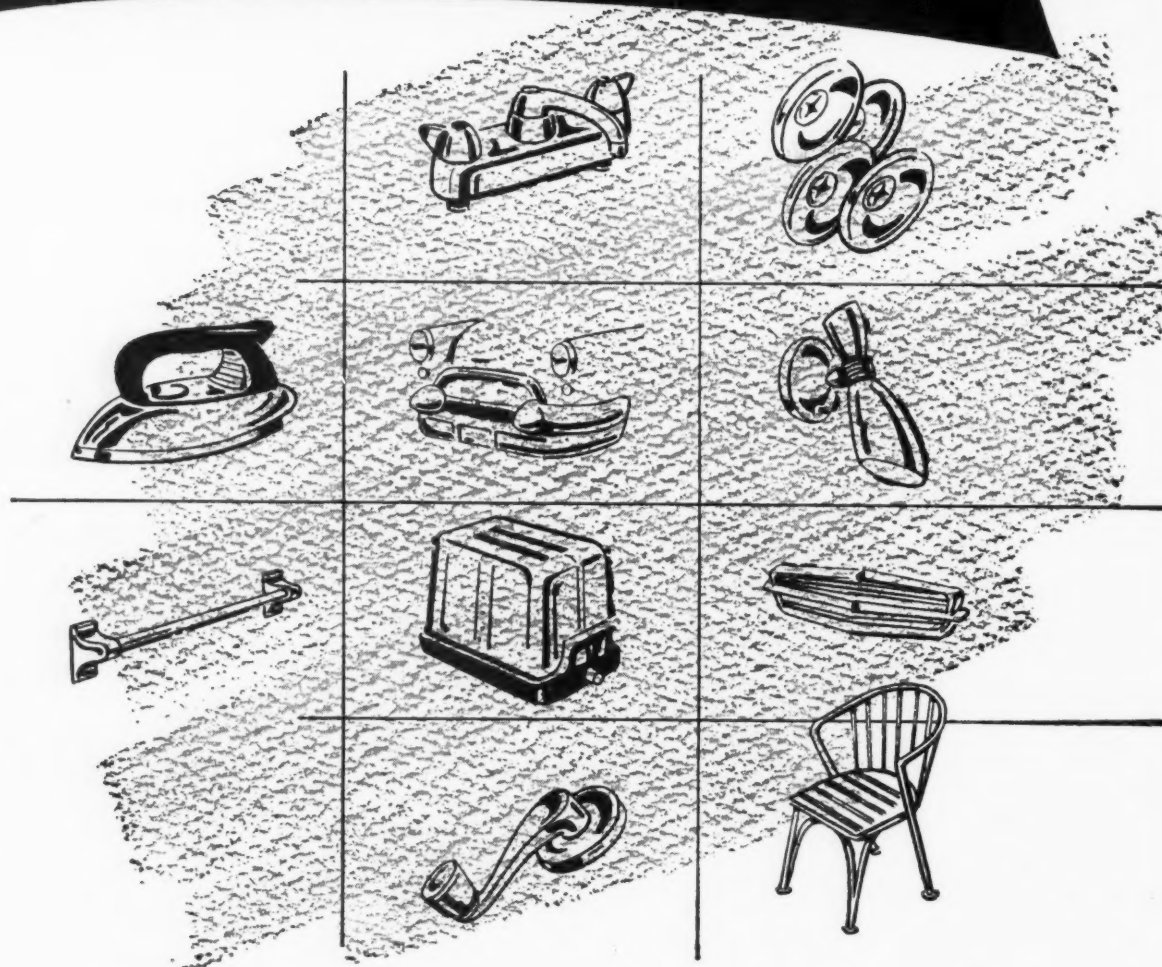
Samples sent on request.

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HARSHAW Nubrite

long, bright nickel plating
operation without treatment



Other outstanding advantages are:

BRIGHT OVER WIDE RANGE

from a few amperes/ft.²
to well over 100 amperes/ft.²

HIGH TOLERANCE to common impurities

HIGHLY RECEPTIVE to chrome

EXCELLENT LEVELING

BETTER BRIGHTNESS with thinner deposits.

SIMPLE OPERATION and CONTROL

Plates brightly from 120°F to 155°F.

pH can vary over a wide range

Liquid addition agents.

**REMAINS DUCTILE AFTER LONG
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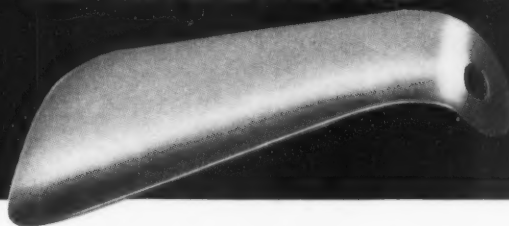
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to shoehorns...



**for fast,
economical
finishing...**



There's virtually no limit to the wide variety of parts, materials and shapes that can be finished *in quantity* by the tumbling method . . . using Borolon abrasive.

Each abrasive particle is a dense, solid mass of tough, fused crystalline aluminum oxide . . . fast cutting and resistant to acids and alkalies. Furnished in lumps (#00 to #3) and *all* screened sizes. Used in all types of tumbling and precision barrel finishing equipment.

Get this **FREE** sample and inspection kit of Borolon Tumbling Lumps and descriptive catalog bulletin. Send us your sample parts for experimental processing and recommended procedures.

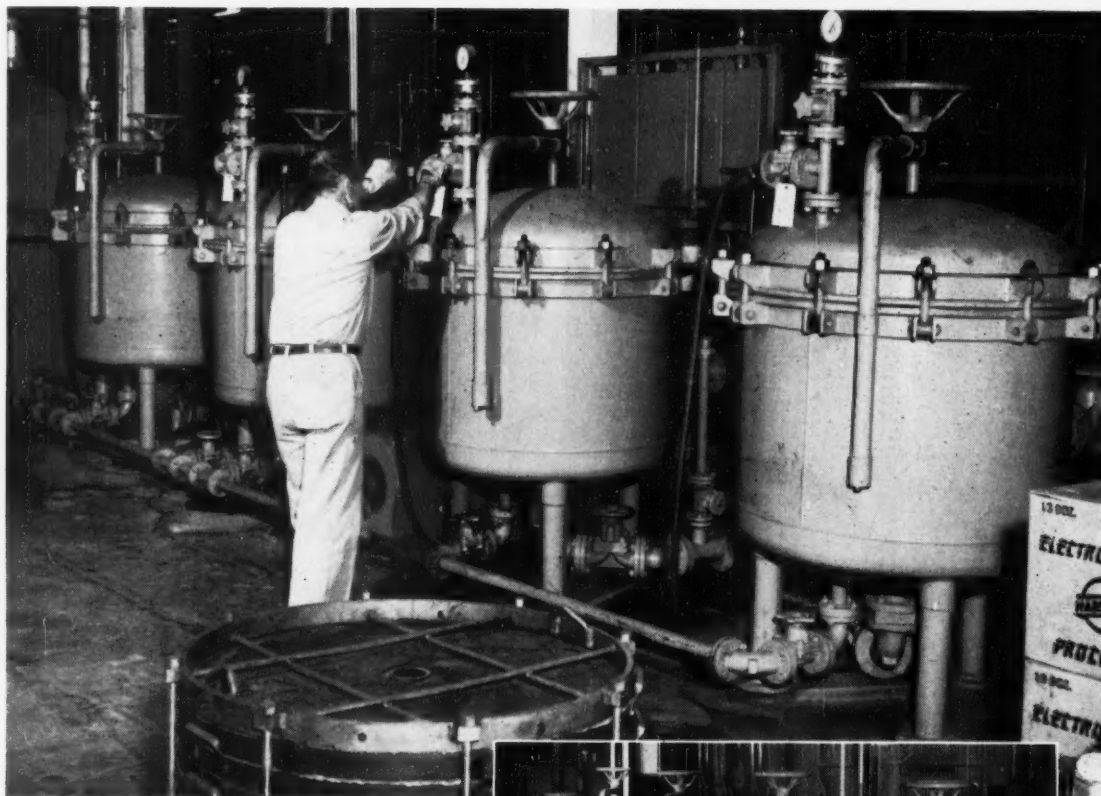
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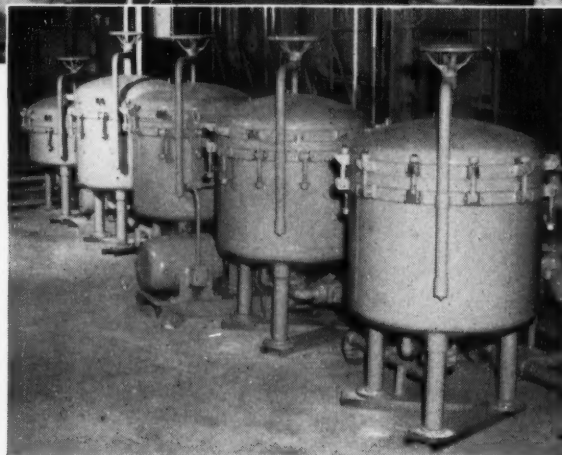
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give
**Low Cost Filtering
of Plating Solutions—**

Plating Plant Engineers will find Sparkler filtration engineers most co-operative to work with on installations of any size.

Write Eric Anderson



2,208,000 gals. of bright nickel solution are filtered in these four Sparkler Horizontal Plate filters (top illust.) through a continuous 5 day cycle with 24 hour operation. Filters are cleaned once a week by lifting out the plate cartridge and replacing it with a fresh dressed set of plates. Only a few minutes is required for this operation.

In the same plating plant, (lower illust.) the four large Sparkler filters are used to filter suspended matter from Ronal bright copper solution. These filters have a flow capacity of 4800 G.P.H. each. The small, far end unit filters suspended matter from a copper strike bath. Capacity 2,100 G.P.H.

On occasion these filters are employed for filtering out activated carbon and lime from copper solution and activated carbon and nickel carbonates from nickel solution.

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Manufacturing plants in Canada, Holland, Italy, and Australia.

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A Timely Message on The Magic Number SEVEN

by Ben P. Sax

President, American Buff Company

From seven-league boots to the seven wonders of the world, the number "seven" has held an important place in *fiction*, in cold hard *fact*, and in great human and scientific *feats*. Today I'd like to talk to you about

THE SEVEN CENTERLESS WONDERS of the metal-finishing world.

Like the famed seven-league boots of old, today's wonder-working American CENTERLESS Buffs are reaching production goals in a *single, effortless step* instead of by costly, slow methods.

The whole idea is an exclusive American Buff innovation—the revolutionary "air-cooled" construction that makes these CENTERLESS buffs run faster without burning—and the patented-locking rings that create American CENTERLESS Buffs' unique "pre-assembly" to produce *amazing* savings in down-time and running time.

This seven-league-boot speed is no laboratory dream. Actual production figures from plants across the nation prove it . . . with gains in output ranging from 25% to 33½%! And this "magic" is accomplished—not with costly new lathes or other machinery—but merely with a switch to any of the seven versatile types of American CENTERLESS BUFFS . . . the SEVEN WONDERS of the metal finishing industry.

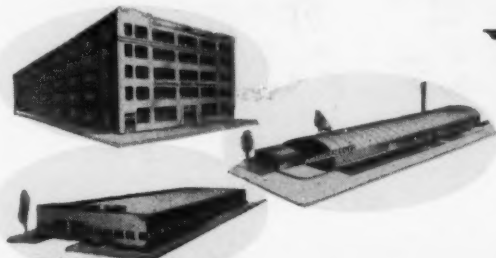
It will be our pleasure to introduce you to the particular buffs that will best serve *your* plant and *your* product.

Sincerely,

Ben P. Sax



"For the job that's TOUGH—use an AMERICAN BUFF"



American Buff Company

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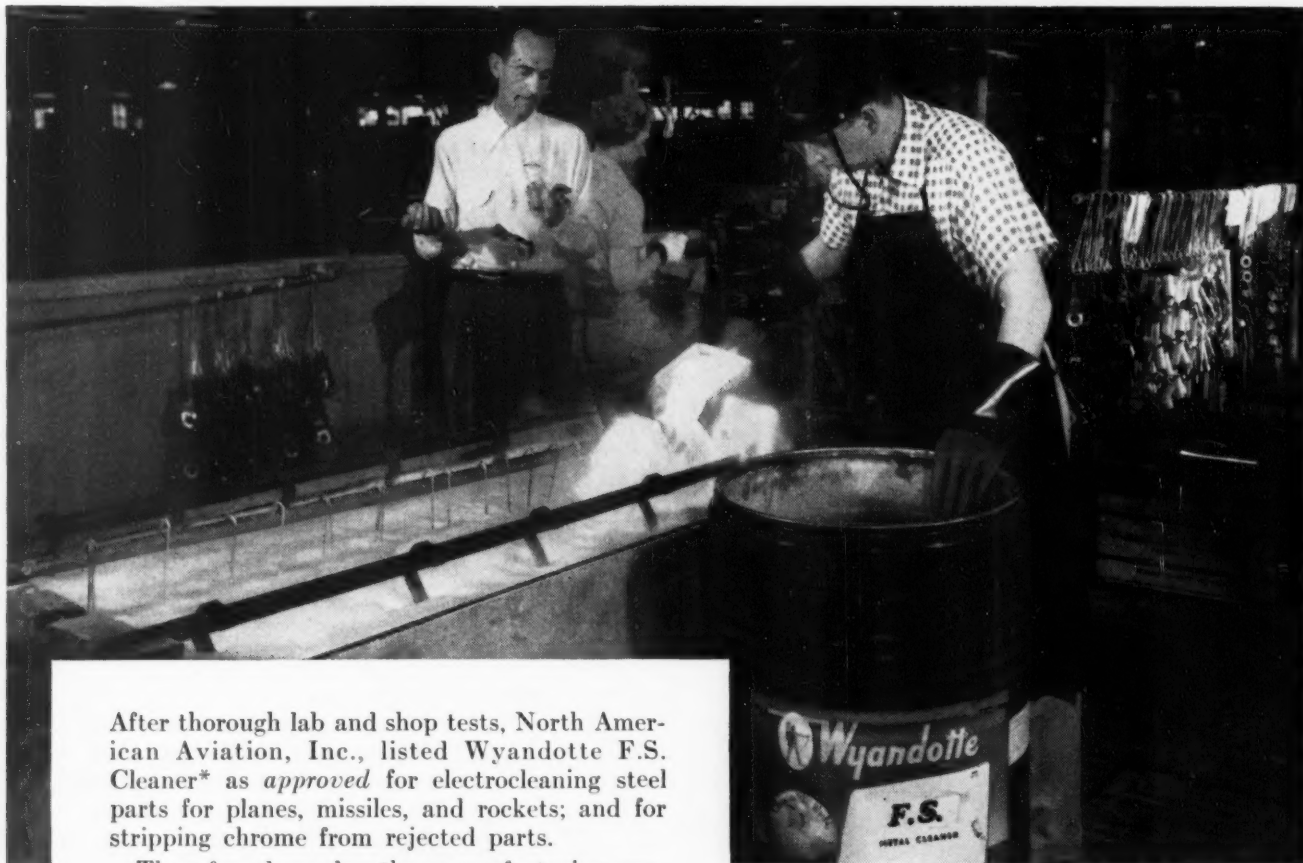
World's Largest Manufacturer of Buffs and Polishing Wheels for Every Finishing Operation.

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Patented Centerless or Permanent Center Construction

AMERICAN BUFFS ARE REGULARLY ADVERTISED IN FORTUNE MAGAZINE

North American lists Wyandotte F.S. as "approved" for electrocleaning steel



After thorough lab and shop tests, North American Aviation, Inc., listed Wyandotte F.S. Cleaner* as *approved* for electrocleaning steel parts for planes, missiles, and rockets; and for stripping chrome from rejected parts.

They found, as do other manufacturing concerns, that F.S. gives them product economy, long solution life, and outstanding cleaning ability.

Wyandotte F.S. Cleaner is noted for its exceptional detergency in removing smut, fabricating oils, and compounds. It features fast, complete wetting action, controlled foaming, and very free rinsing. In addition, it has high soil suspension ability, and is 100% soluble in water. Wyandotte F.S. may be the very electrocleaner you have been seeking for your metal-cleaning operations.

Let the Wyandotte representative show you the results possible with this and other quality metal-finishing products. Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.

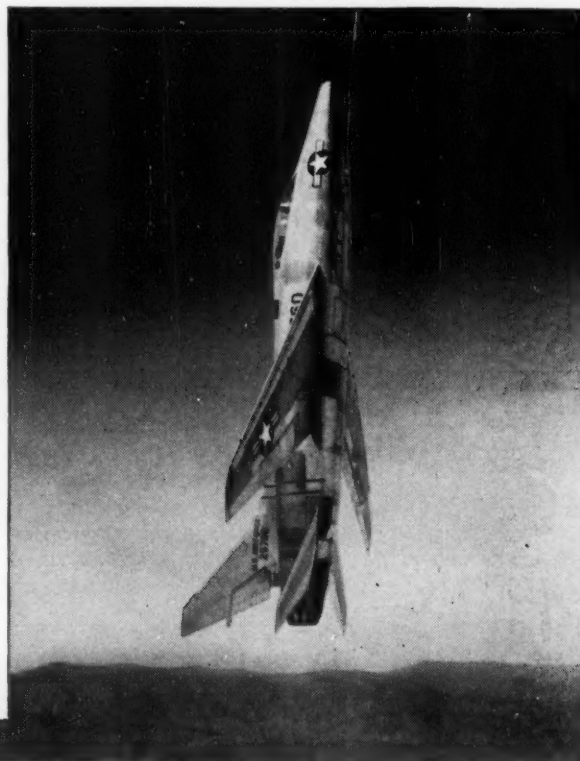
*Reg. U. S. Pat. Off.



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**THE BEST IN CHEMICAL PRODUCTS
FOR METAL FINISHING**

For over three years, North American Aviation, Inc., has used Wyandotte F.S. in their main plant in Inglewood, California, for all steel electrocleaning.





....brings you extra years
of dependable, trouble-free
low-voltage power

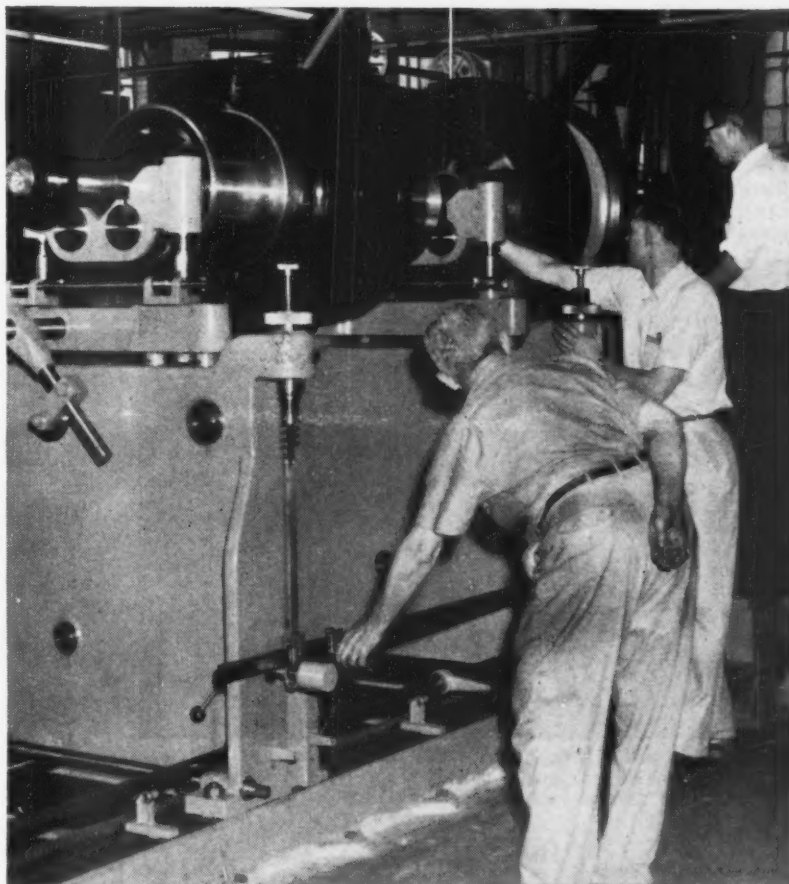
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**DYNAMIC BALANCING
DETECTS AND CORRECTS
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Massive motor generator rotors weighing thousands of pounds are balanced to within fractions of an ounce by this modern equipment in the Chandeysson plant. By spinning the rotors, even the slightest out-of-balance is detected and can be corrected. The result is vibrationless dc equipment that promotes perfect commutation and reduces installation cost . . . advantages that can never be obtained by static balancing such as is common in the industry.

Precision methods such as this are used throughout the Chandeysson manufacturing operation. Unified responsibility for the manufacture of every component . . . from selected raw materials to the finished product . . . is in the hands of skilled men with decades of experience in building low-voltage generators. Our aim in engineering is to *prevent* design defects . . . rather than to correct for them. This is why more and more "Industry Leaders Choose Chandeysson!"

MAKE US PROVE to you that a Chandeysson Motor Generator set is your most economical and dependable source of low-voltage dc current. Mail this coupon today . . .



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Please send bulletin D-101

Name.....Title.....

Company.....

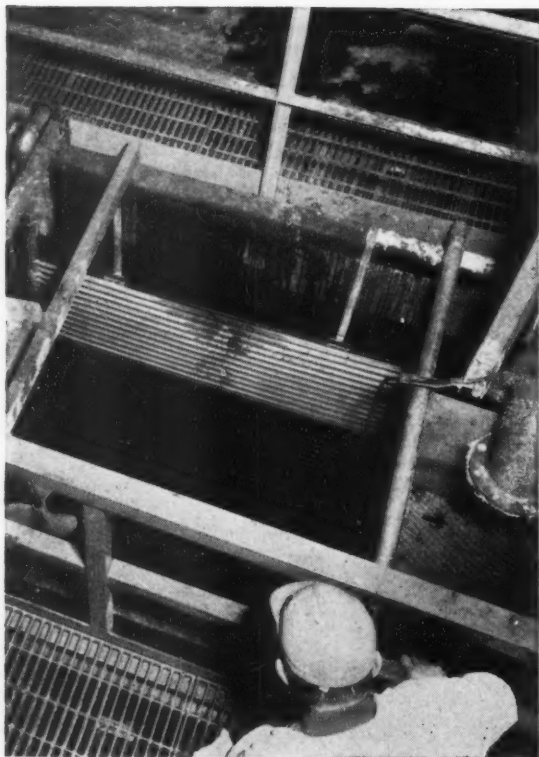
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City.....Zone.....State.....

CHANDEYSSON ELECTRIC COMPANY

4074 Bingham Avenue, St. Louis 16, Missouri

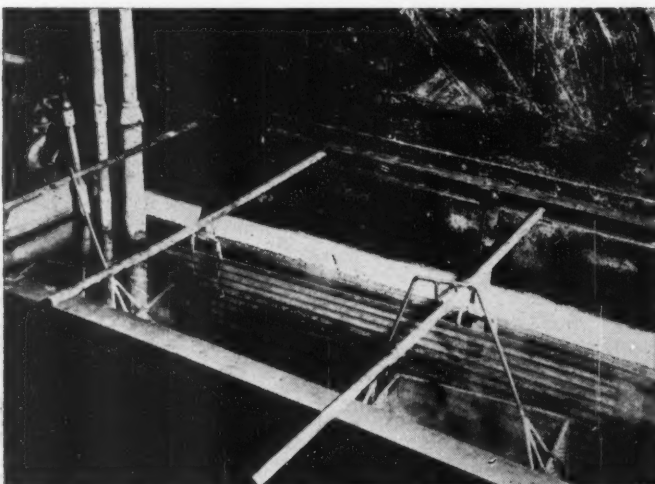
CHA-75-R



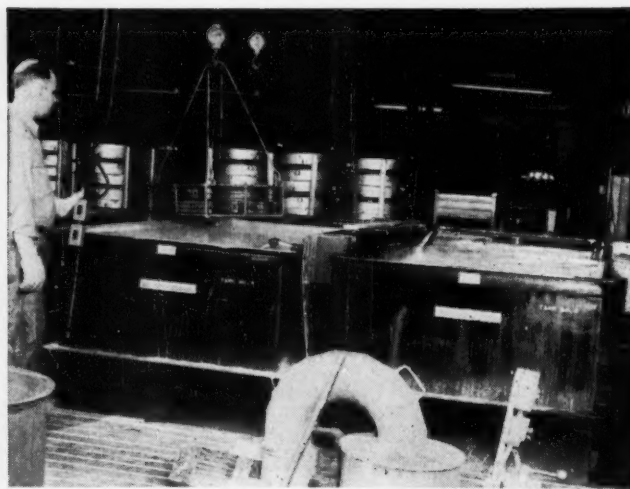
Platecoil units, in the world's largest plating plant, have the speed and dependability to keep up with operations that turn out 1 bumper every 3 seconds.

TRANTER PLATECOIL® STREAMLINES HEAT TRANSFER, CUTS PLATING AND FINISHING COSTS

As streamlined in performance as they are in appearance, Tranter Platecoil units are making big savings for platers and finishers by replacing bulky, old-fashioned pipe coils for heating and cooling. Their solid, relatively flat surfaces resist fouling and scaling and give longer life. When they do have to be replaced, two men can do the job in minutes without hoists or other machinery. And experience has proved Platecoil units heat or cool more quickly and efficiently. Streamline your operations now, and install Tranter Platecoil.



Platecoil makes it possible for this anodizing tank at Jack & Heintz, Inc., to handle more work per load and more loads per shift to increase production 25%.

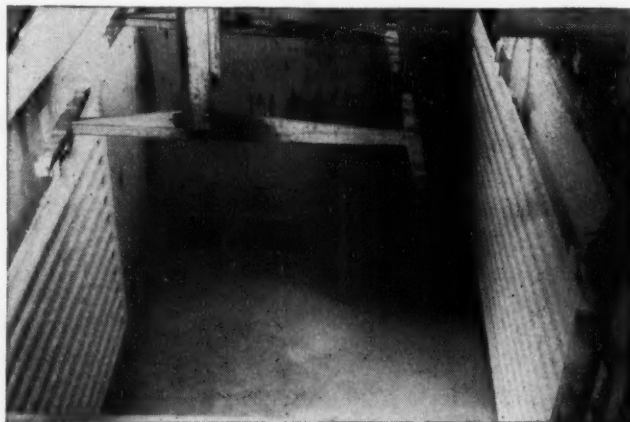


Compact, streamlined Platecoil makes room for 3 times the load in a tank at Continental Motors. Pipe coils also require twice as much time for cleaning.

Streamline your plating and finishing operations with Tranter Platecoil. For more information, send today for Bulletin P-52.



TRANTER MFG., inc.
Lansing 4, Michigan

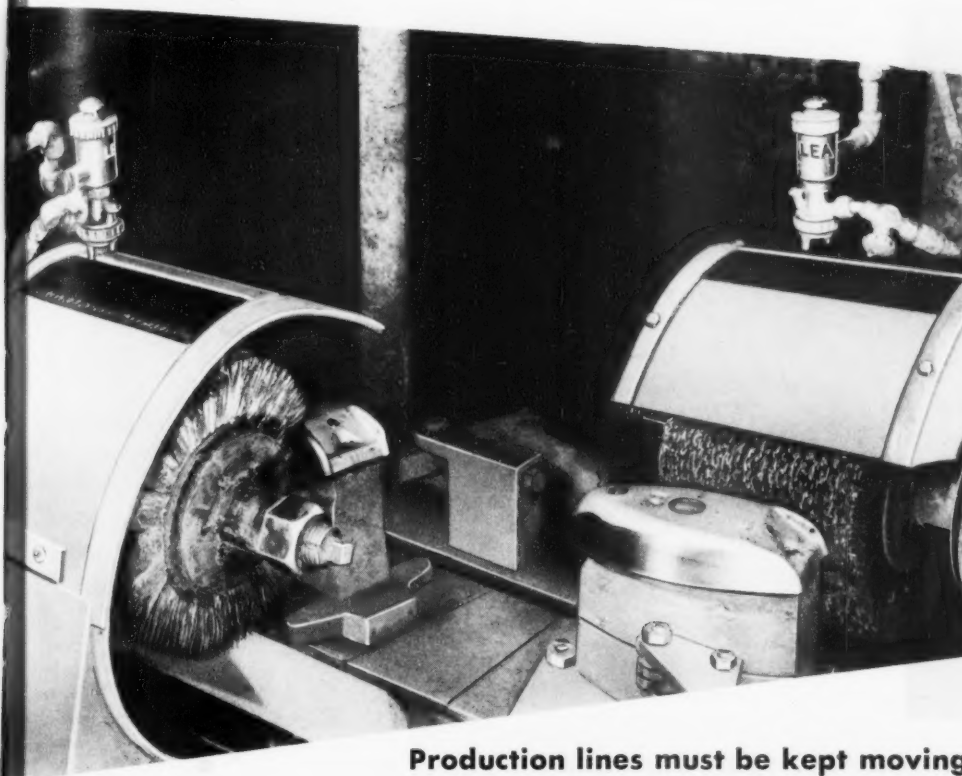


Requiring a minimum of tank space, Platecoil units have sufficient transfer capacity to help speed automatic plating at Atwood Vacuum Machine Co.

You'll Find Our Catalog in Sweet's Plant Engineering File.



LIQUABRADE



**SPRAY
BUFFING**
at its
**AUTOMATIC
BEST!**

Production lines must be kept moving... with surface finishing as with other steps.

LEA LIQUABRADE, available in a wide range of abrasive grain types and sizes, is the ideal liquid abrasive composition for automatic buffing. Already widely used and growing in use,

LIQUABRADE is enabling companies with big production schedules to keep the buffing line moving right along while producing the desired finish at exceptionally economical levels.

Here are some of the high light economics:

- no nubbins waste or rehandling.
- production much faster, of course, than with bar applications.
- the finish is more uniform due to automatic, steady, uniform spray application and uniform cutting action.
- buffs last longer.
- all operations are automatic and continuous.

In large measures these same advantages apply to hand-fed articles with a single wheel. One doesn't have to have production lines to derive values from Lea Liquabrade spray buffing operations.

We'll be glad to send you full details with detailed

range of grit grades. Also suggest how you can set up your operations for spray buffing if you will give us the details of your present operation and a description of your product and the finish desired. Better yet, send samples.

Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing. Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions. Manufacturers of Lea Compound and Leacok Industry's quality buffing and polishing compounds for over 30 years.



*The Hallmark of
Quality Products*

**THE LEA MANUFACTURING CO.
16 CHERRY AVE., WATERBURY 20, CONN.**

Lea-Michigan, Inc., 14066 Stansbury Ave., Detroit 27, Mich.
Lea Mfg. Company of Canada, Ltd., 1236 Birchmount Road Scarborough, Ontario, Canada
Lea Mfg. Company of England, Ltd., Buxton, England
Lea-Ronal, Inc., Main Office and Laboratory: 139-20 109th Ave., Jamaica 35, N. Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

SEE THE OTHER SIDE OF THIS INSERT

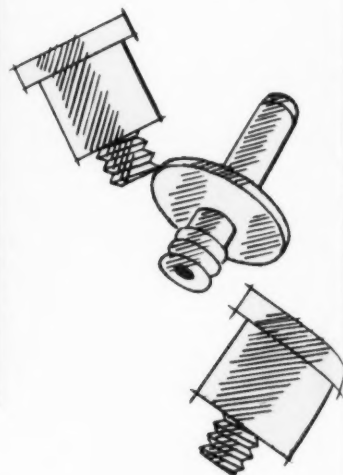
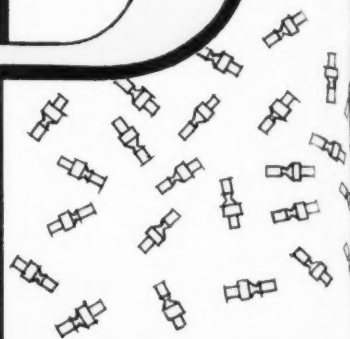
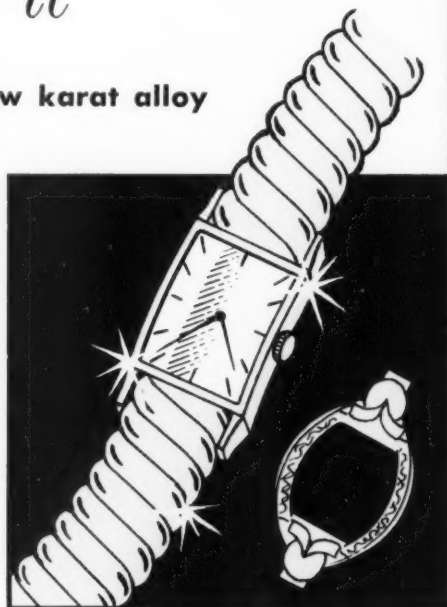
GOLD

as you like it

24 karat

low karat alloy

Since the operations of its first commercially proved decorative gold process in 1949, Lea-Ronal has continually been striving to give the plater gold processes that meet his requirements. As the result of constant research and experience, we can offer platers proved processes with the following outstanding values:



Bright 24 karat or bright low karat alloy (16-20K) directly from the bath.

Economy of operation . . . the Lea-Ronal bath contains only half the amount of gold found in the least concentrated conventional bright baths . . . hence, gold investment is reduced . . . drag-out loss is correspondingly low.

Simple operations and control — both processes operate at room temperature without special current manipulation cycles.

Outstanding wear resistance; a well-known manufacturer conducting a series of controlled wear-tests reports that the resistance of a 0.000050 inch deposit of Lea-Ronal MS was equal to that of a 0.0002 inch deposit from a conventional deposit.

Alloy deposits that are bright with excellent hardness and that can be made to approach rolled gold plate in color.

If your requirements call for 24 karat gold deposits, investigate the Lea-Ronal Bright Gold MS; if alloyed colored deposits, it would be Lea-Ronal Bright Gold MSA.

Why not get full details of either or both? Most existing solutions can be converted. We would appreciate it if when writing, you would outline your operations and detail your problem.



Lea-Ronal Inc.

Main Office and Laboratory:
139-20 109th Avenue, Jamaica 35, N. Y.

Manufacturing Plant:
237 East Aurora Street, Waterbury 20, Conn.



Are you interested in Buffing, Polishing and Burring Specialties? SEE THE OTHER SIDE OF THIS INSERT.

They are ALL turning to BELKE Thinker Boy

For lowest overall racking costs

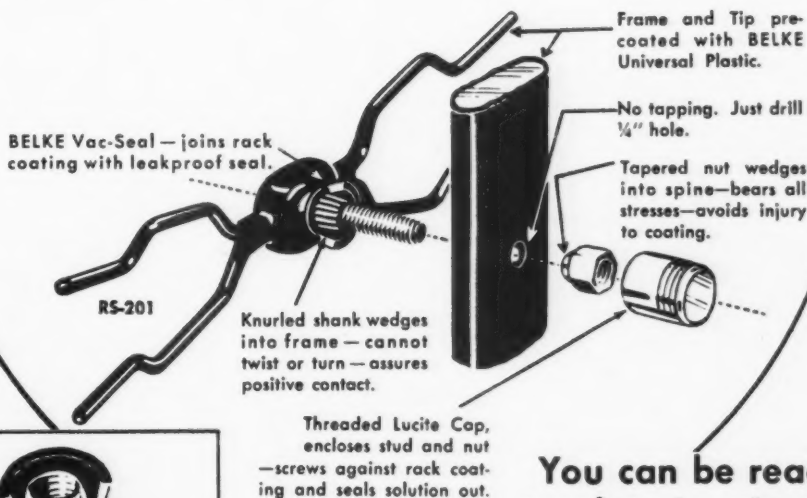
Achieved through long life, adaptability and re-use factors.

For efficient "new job" racks in jig time

Assembled from stocks of Thinker Boy Rack Members and Tips.

For full rack capacity through tremendous use life

By convenient "on the job" tip replacement.



You can be ready to plate in minutes

With Thinker Boy you can assemble racks you design for the job when you need them—no delay—no waiting.

You can make single, double, and triple spine, cross bar and tee racks, with endless variations and in a wide range of dimensions.

What's more—you can replace broken tips in a jiffy—keep Thinker Boys at full capacity

When a Thinker Boy Rack is no longer needed you can install tips to rack other work or disassemble and re-use the members in new racks.

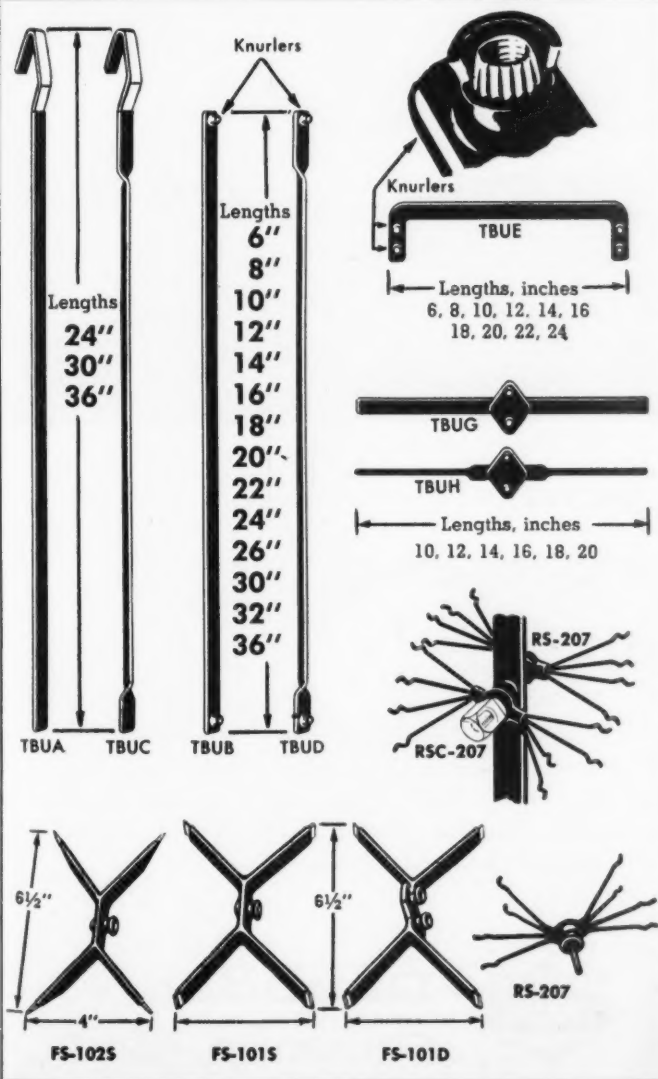
Just think! With Thinker Boy Parts you can assemble a sample rack to fit the actual work in a few minutes. Have definite figures for estimating costs. Be in production in a few hours.

Send for the Thinker Boy Bulletin. See the many different rack styles you can assemble and the great selection of Thinker Boy Tips available.

Acquaintance with Thinker Boy opens up a big field of opportunity for reducing costs.

For low cost,

ready made, mass produced, rigidly assembled all copper, plastisol insulated racks send for BELKE Economy Rack Bulletin.

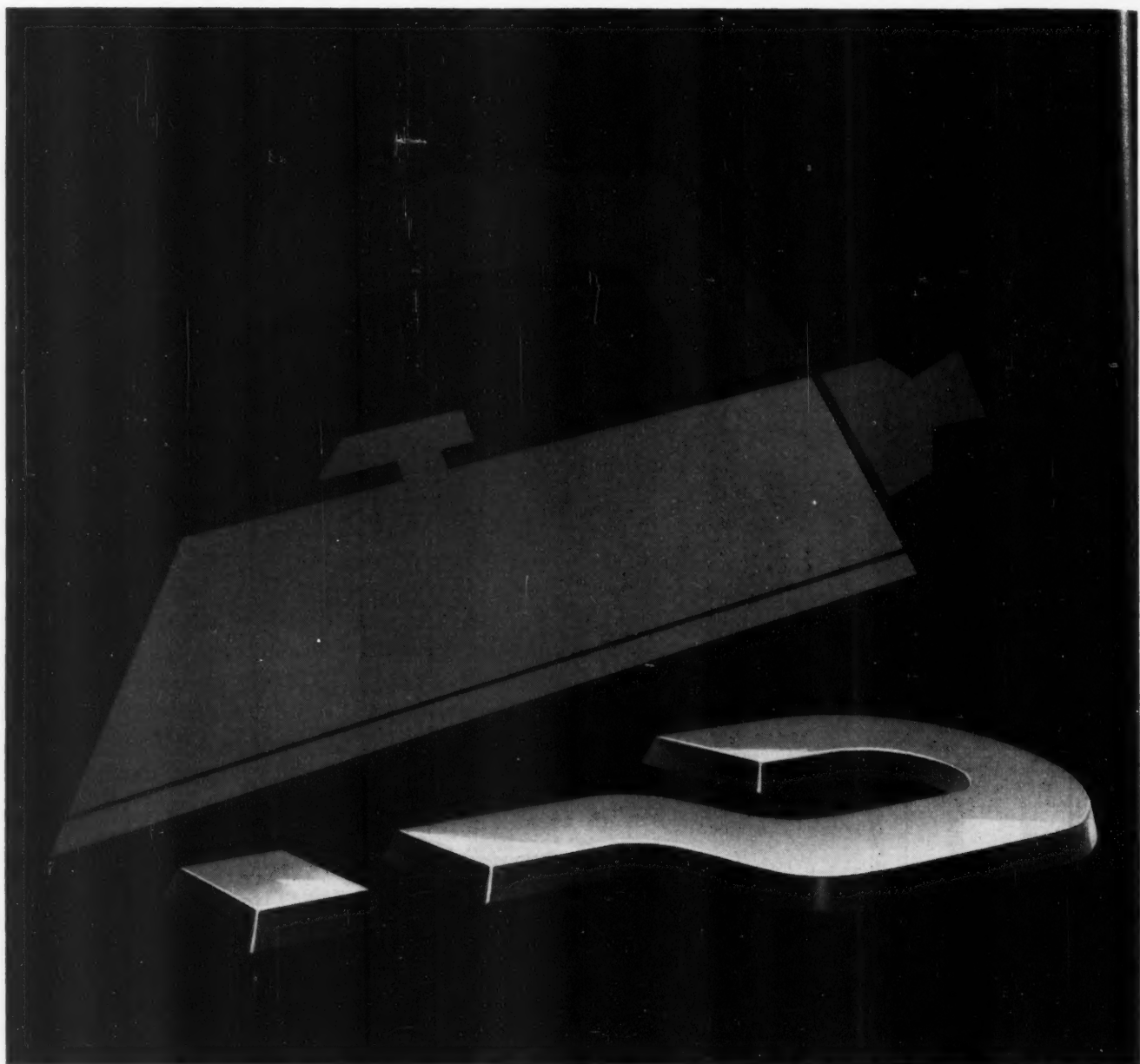


Belke

Manufacturing Co.

947 N. Cicero Ave., Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS



Iron out your chrome-plating problems with Diamond

Let DIAMOND's technical specialists go to work on your chrome-plating problems. These men work full time on customers' questions. They come up with complete, profit-making answers. Their service is free.

In producing chromic acid, DIAMOND controls *every* processing step to safeguard quality. DIAMOND experience starts with importing the chrome ore and making the soda ash, and extends through production and delivery. It even includes standing by your side, if you wish, to help you get top-quality plating results and keep costs low.

DIAMOND facilities—two chromic acid plants and nine warehouses and sales offices across the country—assure you uninterrupted supply and dependable service. DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.



**Diamond
Chromic Acid**

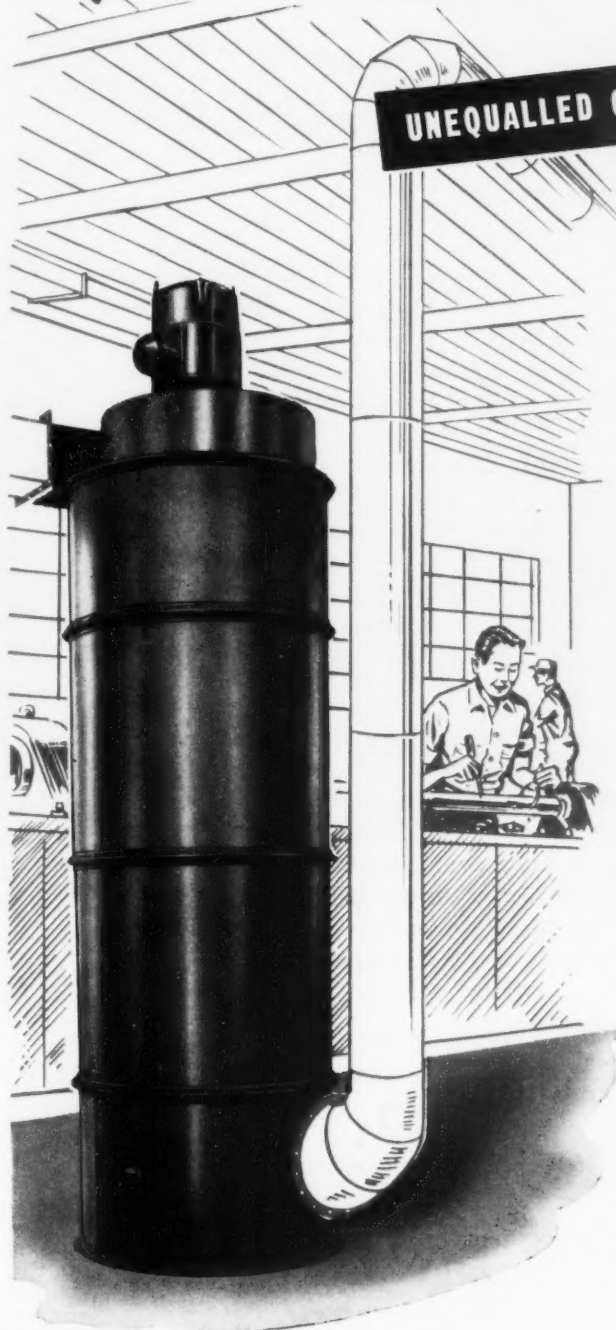
Cyclonaire—

THE FIRST COMPLETE "PACKAGED" FUME WASHER PROVIDES

UNEQUALLED COMPACTNESS

GREATER FLEXIBILITY

SUPERIOR EFFICIENCY

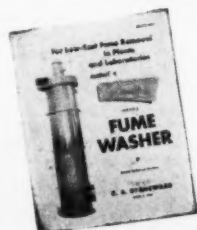


The Cyclonaire is compact and inexpensive . . . yet so efficient it handles big fume removal jobs formerly requiring larger, custom built units. This increased capacity-to-size ratio is due in large degree to Intalox Saddle packing — the "heart" of the Cyclonaire. Intalox Saddles provide more *useful* wetted surface area, greater randomness of packing and a higher percentage of free space through the bed than any other tower packing. Thus fumes are more efficiently scrubbed at high C.F.M. rates, removing up to 99.9% of many gases in concentrations of 1% or less. The Cyclonaire safely handles corrosive gases in low concentrations.

You can order a Cyclonaire in any one of four standard "package" models, in capacities ranging from 750 to 6,000 c.f.m. However, many variations are possible to meet virtually every requirement. For instance:

When 100% fume removal is required, scrubbing action can be increased in any model either by adding additional packed sections or using two Cyclonaire units in series. If additional c.f.m. capacity is needed, two or more standard units can be used in parallel. Where elimination of dust or spray is the only problem, whole packed sections may be omitted or the amount of packing reduced. Where fumes are not soluble in water, absorbent chemical solutions can be employed by using recycling equipment. These are but a few of many variations possible.

The Cyclonaire is constructed of steel in easy-to-assemble flanged sections. Installation takes only a few hours, and it can be disassembled and relocated in a comparably short time. All inner surfaces are protected by a 3/32" thick corrosion-resistant Tygon lining. (The same basic lining that protects pickling and plating tanks.) Exterior surfaces are coated with Tygon ATD Hot Spray.



Write today for Bulletin FW-5 which presents detailed and illustrated technical data.

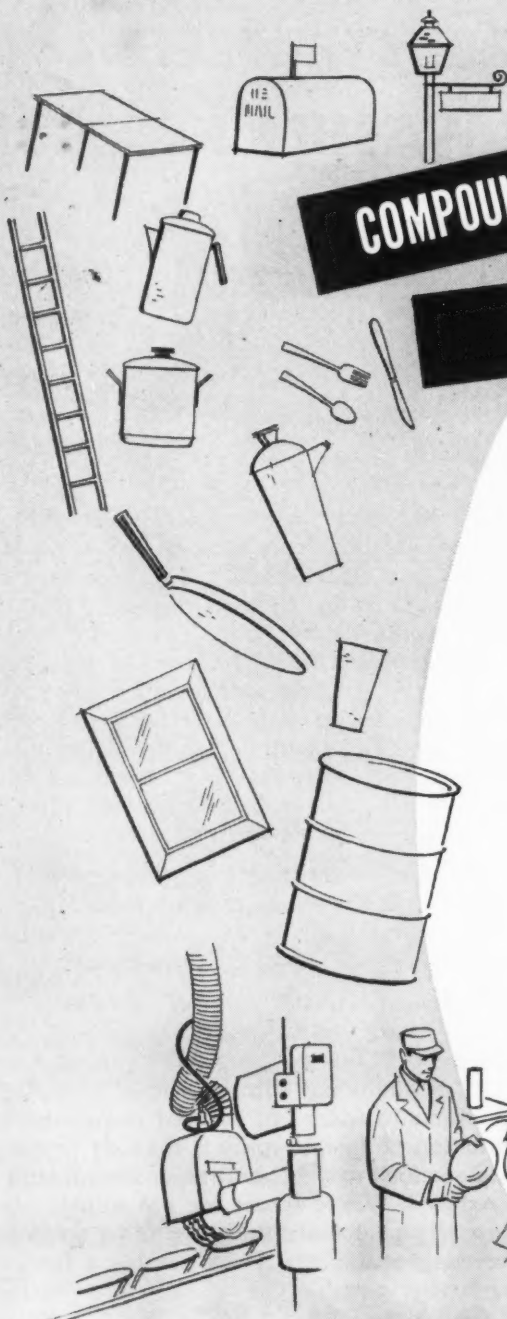
251-E

PROCESS EQUIPMENT DIVISION

U. S. STONEWARE

AKRON 9, OHIO

H-VW-M—the manufacturer with...



**COMPOUNDS DESIGNED EXCLUSIVELY
FOR ALUMINUM FINISHING!**

H-VW-M long ago anticipated today's tremendous popular demand for aluminum products—by developing special compounds like Liquimatic 728 to suit the unusual characteristics of this soft metal. Heavy-duty Liquimatic 728 is formulated *expressly* for aluminum finishing. It's a true double duty compound, combining special cutting qualities with excellent coloring properties. And it works so clean, and cleans so easily that it's especially suited for buffing before anodizing. For color anodizing, too, it brings out deeper, richer tones every time.

Liquimatic 728 is just one of a full line of H-VW-M liquid and bar compounds developed solely for use in aluminum finishing. And it's not only compounds that H-VW-M supplies to make aluminum finishing easier . . . faster . . . *better*. In the H-VW-M line you'll find anodizing equipment—automatic buffing machines and other equipment—all types of buffs—everything you need, in fact, from start . . . *to finish!*

Write today for bulletins describing the H-VW-M equipment, supplies and compounds designed especially for aluminum finishing.



Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.



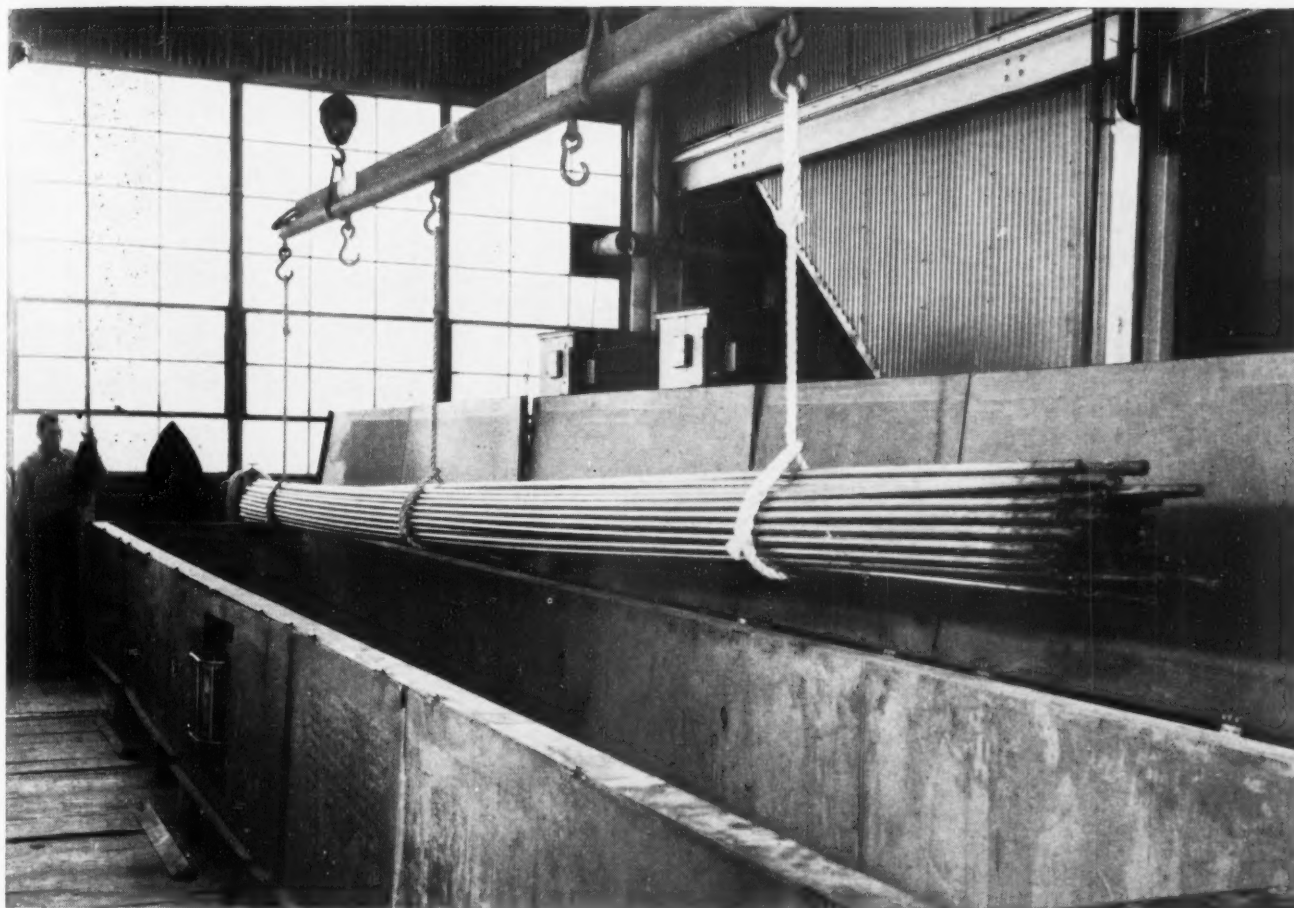
H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

HANSON-VAN WINKLE-MUNNING COMPANY

Main Office and Plant, Matawan, New Jersey

J. C. Miller Division, Office and Plant, Grand Rapids, Mich.
SALES OFFICES: Anderson (Ind.) • Baltimore • Beloit (Wisc.) • Boston
Bridgeport • Chicago • Cleveland • Dayton • Detroit • Grand
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Wallingford (Conn.)



Sawhill Tubular Products reports:

"Thorough cleaning, no etching when we degrease tubing with TRICLENE® D"

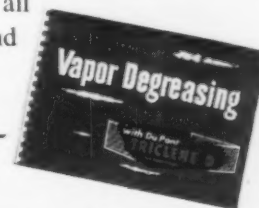
"We've bought 'Triclene' D by the tank-wagon load since it first came on the market," says Mr. C. H. Albright, General Purchasing Agent of Sawhill Tubular Products, Inc., Sharon, Pa. "And it's the most efficient solvent we've found for degreasing stainless- and carbon-steel capillary tubing—inside and out.

"In addition to thorough, trouble-free cleaning, 'Triclene' D also makes our next operation—annealing—much easier. Here, any residue on metal surfaces affects the quality of the anneal. After switching to 'Triclene' D,

we noticed a healthy reduction in the number of rejects."

Other advantages noted by Sawhill were easier solvent control, steadier pH and no etching on highly polished surfaces. In short, Sawhill had fewer solvent worries.

GET ALL THE FACTS about "Triclene" D and vapor degreasing in this new 42-page booklet. Here you'll see how this rugged solvent is used for all metals and in all industries. Send for your free copy today.



TRICLENE® D
TRICHLOROETHYLENE



REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Department MF-10
Wilmington 98, Delaware

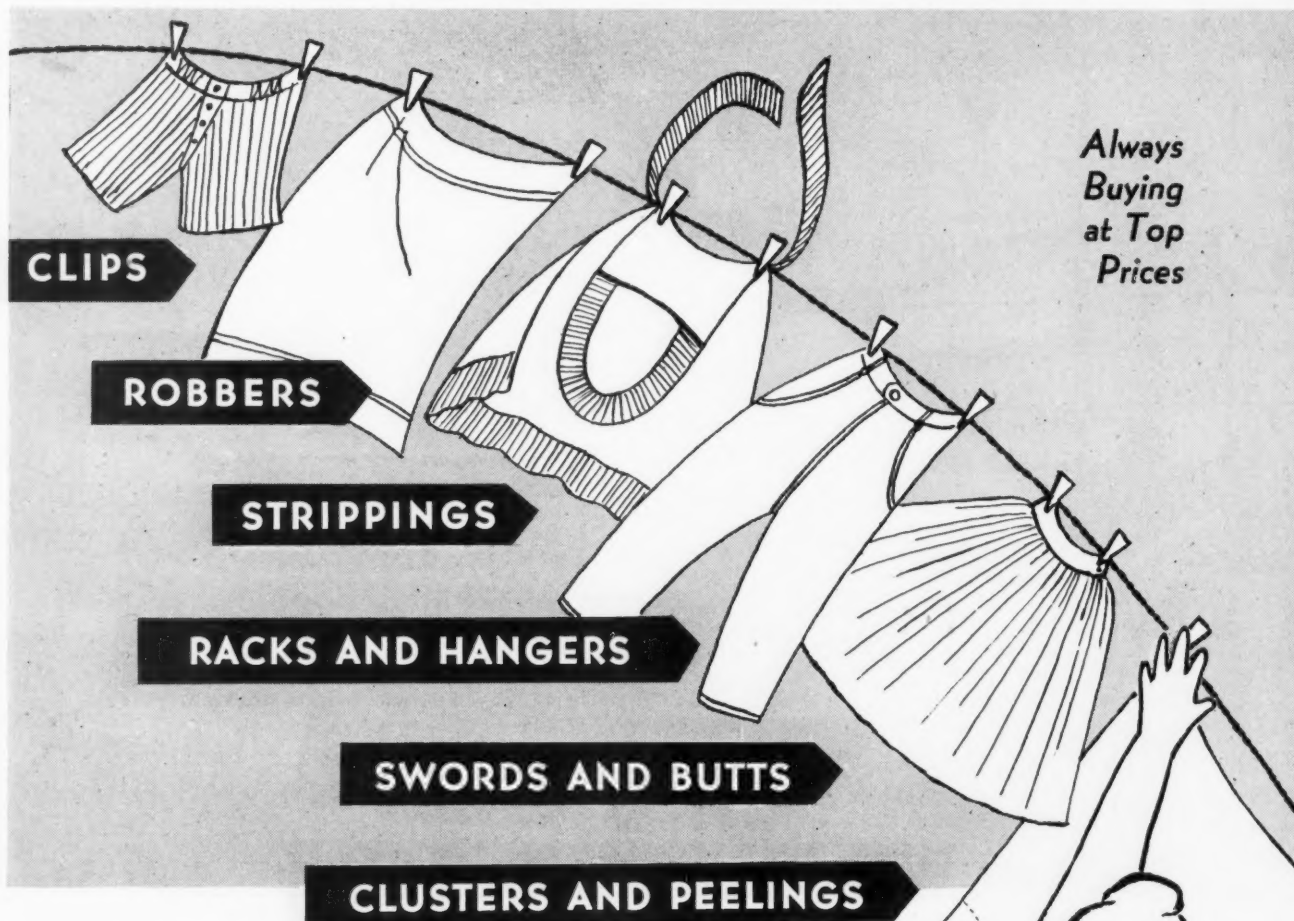
- ☐ Please send me a copy of your new vapor-degreasing booklet.
☐ Please have your Representative phone for an appointment.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____



Whether it's a carload
or a basketful, you're
On the Right Line
when you ship us your

NICKEL PLATER'S SCRAP

For prompt quotation send us a 5-lb.
representative sample of your accumulation.

Invoice us for sample . . . or we will pay on basis of laboratory analysis.

Phone . Wire . Write

Stainless Steel Corp. of America

OHIO EDISON BLDG. YOUNGSTOWN 3, OHIO

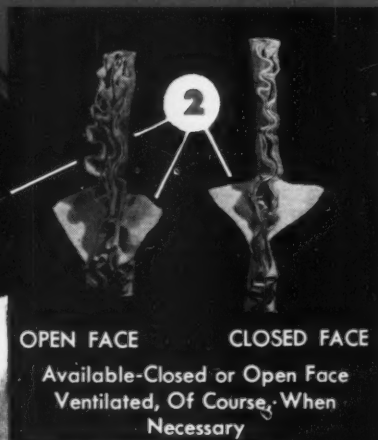
Riverside 4-4123

No other Buff...

has all these advantages

CODMAN NON-FRAY BUFFS

1. THICKNESS OF RING VARIES DENSITY
2. TRAILING ENDS — (Safety)
3. NON-COMPRESSIBLE CONSTRUCTION
4. NON-METALLIC CENTER — (No Shaft Scoring)



F. L. & J. C. CODMAN COMPANY

ROCKLAND, MASSACHUSETTS

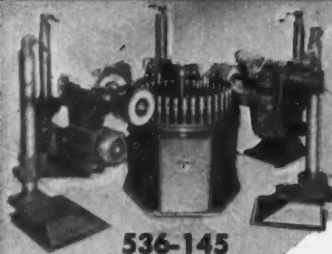
the greatest name in buffs for over 55 years

BRANCH OFFICES — PHILADELPHIA, DETROIT, LOS ANGELES, INDIANAPOLIS, GRAND RAPIDS

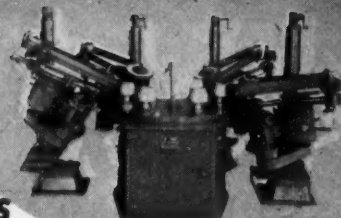


ACME *Rotary Automatics*

... cut costs on
production finishing

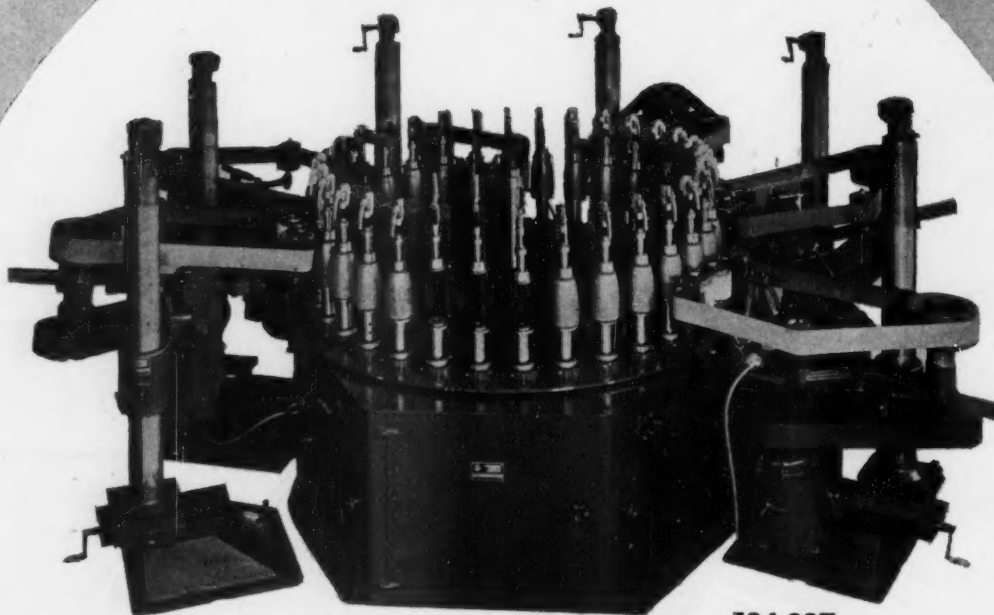


536-145



512-9-2

ROTARY TABLES
ARE AVAILABLE IN SIZES
UP TO 24 FT. DIAMETER

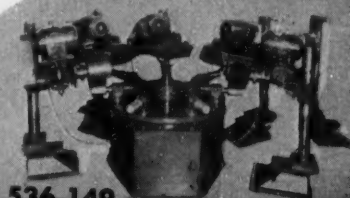
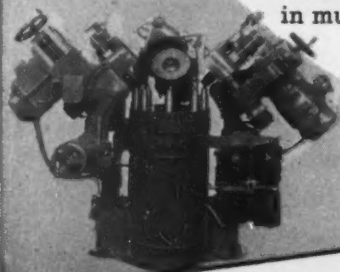


534-337

ACME 8 FT. *Combination Type* ROTARY AUTOMATIC

● This machine can be readily changed from a 32 spindle continuous rotary automatic to an 8 station indexing rotary automatic by simple hand crank adjustment. Various types of ACME adjustable floating head polishing and buffing lathes are used including belt arm attachments on buffing heads, utilizing the same heads for buffing or belt operations. Spindle arrangements are available in multiples of 8.

Rotary Catalog on Request.



536-149

RECOMMENDATIONS and QUOTATIONS . . . will be offered on receipt of blue prints or preferably finished and unfinished parts you contemplate finishing, together with details of your present finishing operations and production requirements.



ACME Manufacturing Co.

1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.
Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY



Lift mechanism part for tractor takes cadmium finish smoothly after cleaning in caustic solution.

HIGHER POWER ALKALINITY AT LOWEST COST

Get Dow caustic flake for economical, thorough stripping

Caustic soda flake by Dow . . . low cost, effective metal cleaning. These free-flowing, uniform flakes give users the very maximum in alkaline stripping power.

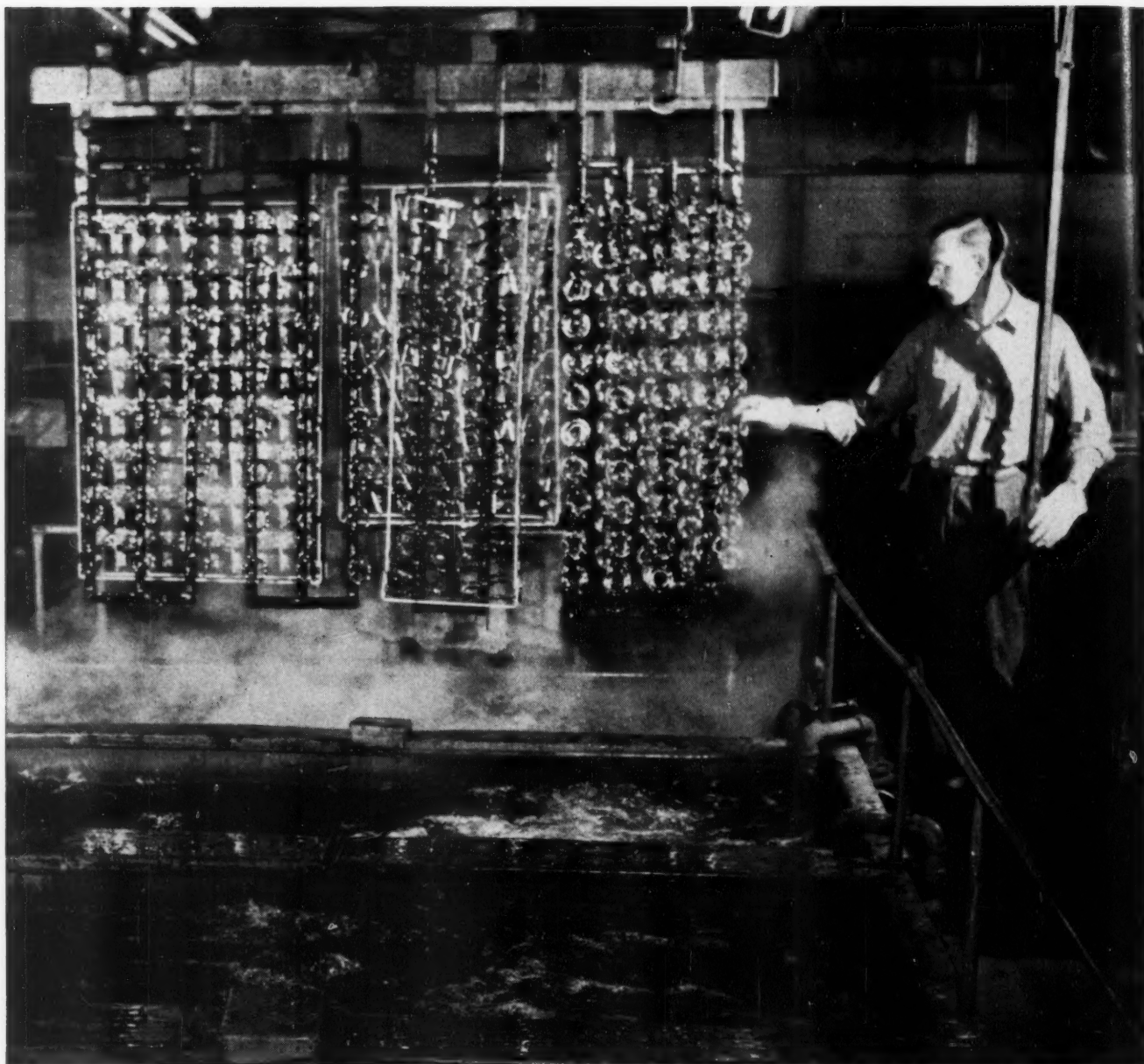
Full *supply* of this unmatched caustic flake is assured through Dow multi-plant production: Midland, Michigan; Freeport, Texas; Pittsburg,

California. Dependably prompt *delivery* is as certain, with the extensive Dow distribution network of terminals and regional stock points.

When a better stripping job at lowest cost can be yours for the asking . . . it's good sense to ask for Dow caustic flake. THE DOW CHEMICAL COMPANY, Dept. AL 753J-2, Midland, Michigan.

you can depend on DOW CHEMICALS





Hot rinsing plated parts at The Electric Auto-Lite Company, Woodstock, Illinois

How Auto-Lite's plating plant cuts waste-treatment costs in half!

Auto-Lite's castings go from the chrome plating baths into a "save rinse" where most of the adhering chrome solution is removed. Then castings get three more cold rinses and a final hot rinse.

When chromic acid concentration builds up to 5% in the "save rinse", the solution passes through a cation exchanger containing Permutit Q for the removal of metallic impurities. After concentration, this purified acid goes right back to renew the plating bath's strength.

Water from the cold rinses contains about 300 ppm of chromic acid. It is recirculated through a cation exchanger containing Permutit Q which takes out metallic impurities. Then it is passed through an anion exchanger containing Permutit S which takes out and holds the chromate

ions, producing demineralized water. The chromic acid, absorbed as chromate in the anion exchanger, is recovered by regenerating with caustic soda and passing the regenerant effluent through the cation exchanger (Permutit Q). The recovered acid solution is concentrated by evaporation to the desired concentration for re-run in the plating bath.

Results: Waste-treatment of rinse water is completely eliminated. The demineralized rinse water can be re-used indefinitely to cut water costs. Plating baths last many times longer. Chromic acid consumption is cut 65%. Total waste-disposal treatment costs are cut in half! And they get a cleaner, higher-grade plating job.

In the same way, ion exchange cuts costs in anodizing, bright dipping, pickling, brass

etching, copper stripping. It also recovers copper and zinc from rayon wastes, concentrates uranium from complex ores, removes impurities from sugar, drugs, antibiotics.

We'll be glad to look into ways ion exchange might improve *your* process. The Permutit Company, Dept. MF-10, 330 West 42nd St., N. Y. 36, N. Y. or The Permutit Co. of Canada, Ltd., Toronto 1, Ontario.

PERMUTIT®

rhymes with "compute it"

ION EXCHANGE for Water Conditioning

Chemical Processing • Industrial Waste Treatment

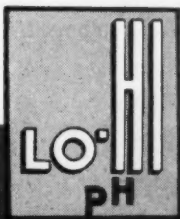
A NEW ACHIEVEMENT IN SPRAY-CLEANING EFFICIENCY

JET CLEANERS

The JET series was developed to fill the need for economical, efficient, low-foaming spray cleaners to be used on zinc, copper, brass or steel.

- ▶ JET CLEANERS step-up the efficiency of your spray cleaning equipment.
- ▶ Reduce overflow loss with new low-foaming formula (no silicones or troublesome chemicals), permitting wider range of concentration.
- ▶ Carry heavier dirt load without redeposition.
- ▶ Remove all types of soil.
- ▶ Are harmless to rack coatings and equipment.
- ▶ Non-toxic, dust-free, non-caking.
- ▶ Offer better results at lower cost.

Remember — YOUR COST
PER FINISHED ARTICLE IS THE
TRUE COST OF YOUR CLEANER



Let the Northwest Cleaning Specialist explain JET CLEANERS' advantages in your production.

NORTHWEST CHEMICAL CO.

9310 ROSELAWN

DETROIT 4, MICH.





- Unobstructed side walls
- Large storage tank
- Demand type water control
- Choice of heating systems
- Leak-proof stainless steel pump
- One-piece condensate coils

the new, all new **CIRCO** degreaser

Completely redesigned for performance and economy, the revolutionary new Circo degreaser will save you 30% or more on solvents, 40% on maintenance *and will last twice as long*. Over 208 standard models in numerous corrosion-resistant combinations are available to meet your every need. Advanced design for long life and dependability, operating advantages never before realized, and a nation-wide engineering field service combine to make Circo vapor, solvent-vapor-solvent, vapor-spray and ultrasonic quality degreasers the economical answer to every mass production or small shop requirement.

Complete information on request
 Bulletin OP2 on solvent degreasers
 Bulletin UC1 on ultrasonic equipment
 Bulletin 521 on metal washing equipment



Since 1923

CIRCO EQUIPMENT COMPANY

51 Terminal Avenue, Clark (Rahway), New Jersey

OFFICES IN PRINCIPAL CITIES
 Nation-wide Engineering Field Service



Photo courtesy Kaybar, Inc., Birmingham, Michigan

what's going on here?

Unichrome Coating 218X, of course!

EVERY USER *knows* that in coatings for racks and screens, there's never any question of quality with Unichrome Coating 218X. This vinyl plastisol endures all plating and cleaning cycles, does not contaminate sensitive baths, survives long hard use without damage. Users know too, that through its extended service life and reduced maintenance, they're getting lowest costs.

If you don't want to apply it yourself,

nearby, experienced, skillful specialists can apply Coating 218X for you. Ask us for names.

PLATING MATERIALS
ORGANIC COATINGS
TIN & TIN COMPOUNDS
CERAMIC MATERIALS
RADIOGRAPHIC EQUIPMENT
WELDING SUPPLIES
METALS & ALLOYS
HEAVY MELTING SCRAP



METAL & THERMIT
CORPORATION

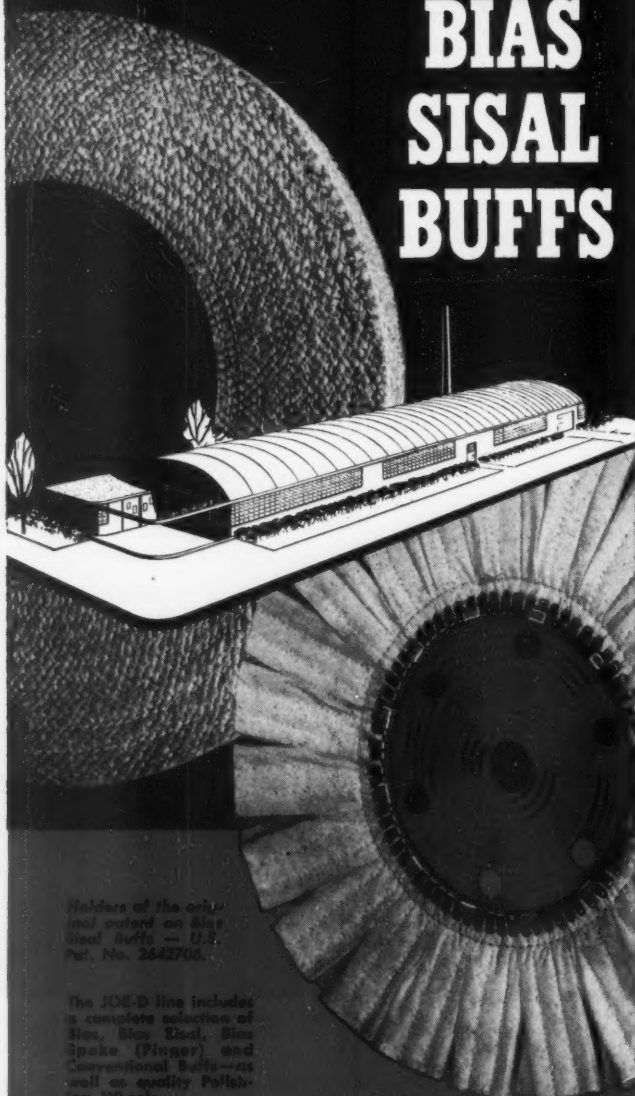
GENERAL OFFICES: RAHWAY, NEW JERSEY

Atlanta • Pittsburgh • Detroit • E. Chicago • Los Angeles

In Canada: Metal & Thermit-United Chromium of Canada, Limited, Toronto.

The "House that Sisal Built"
JOE-D ... Originators of

BIAS SISAL BUFFS



Holders of the original patent on Bias Sisal Buffs — U.S. Pat. No. 2642706.

The JOE-D line includes a complete selection of Bias, Bias Steel, Bias Spoke (Finger) and Conventional Buffs—as well as quality Polishing Wheels.

Since its founding, the JOE-D Buff Company has specialized in Sisal—constantly experimenting and testing ways to give you faster-cutting, longer-lasting Sisal Buffs. Made of the finest quality imported sisal, specially woven and processed for guaranteed fray-proof performance... never a loose end to whip or scratch... always an even nap to hold compound and provide better color. For every Sisal Buff requirement, specify JOE-D, the original—and still America's finest—Bias Sisal Buff.

ATTENTION JOBBERS: Some choice territories are available. **WRITE TODAY!**

the JOE-D Buff Company
 SANDWICH, ILLINOIS • TELEPHONE 2171

another product improved...

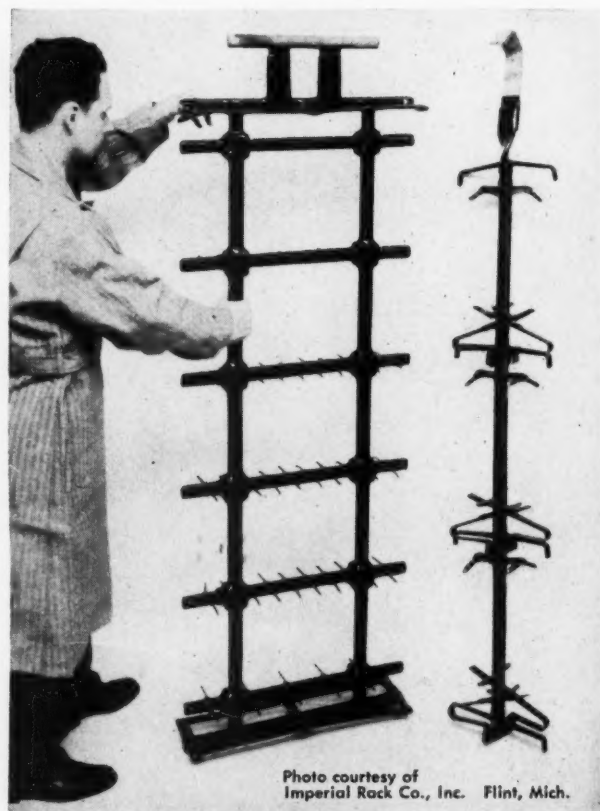


Photo courtesy of Imperial Rack Co., Inc. Flint, Mich.

chem-o-sol®

coating adds life to these PLATING RACKS

Chem-o-sol's excellent chemical and heat resistance means longer life for plating racks and other plating equipment.

A smooth, rapidly draining coating of **chem-o-sol** on plating racks will reduce carry-over of solutions, protect them from contamination.

This special **chem-o-sol** can be applied to equipment in just one dipping operation. Also available in spraying form for in-shop application to bulky equipment such as tanks, fans and other items subject to corrosive deterioration.

Our custom formulated plastisol (**chem-o-sol**) has been tailored to the plating industry by a company whose experience has covered many years as well as many industries. We have developed **chem-o-sols** for application by dipping, molding, spraying, die-wiping, spreader coating, printing, and many other methods.

Our laboratory and research facilities are at your service. We welcome your inquiries and your problems.

Chemical Products



KING PHILIP ROAD • EAST PROVIDENCE, R. I.

How it Works!

Only new Sarco TD steam trap uses kinetic energy of steam to close valve

GAS MANTLES have been replaced by electric lights, steam locomotives by diesels, propeller planes by jets.

Now, the use of the kinetic energy of steam principle gives us a modern type steam trap.

The Sarco TD obsoletes all other types for 10

to 600 psi installations. For example, it operates without a valve closing device—no bucket, float, bellows, pins, levers or gaskets.

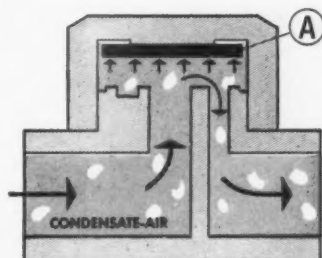
Glance below and you'll agree that no other steam trap is even similar to the Sarco TD!

For a trial installation—write today.



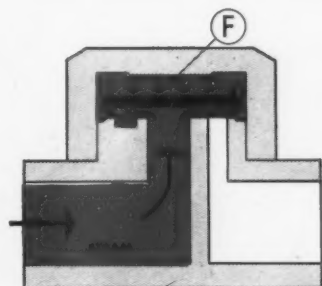
Many Advantages

1. *Practically no maintenance*—no valve mechanism, no narrow channels. Trouble-free simple design. Only 3 parts—all stainless steel.
2. *One trap for all pressures*—self-adjusting. One large capacity seat for 600 psi as for 10 psi. No changes or adjustments.
3. *Operates equally well on all loads*—on heavy, light or no condensate load. No prime to lose. No adjustments.
4. *No steam leak required*—to operate the Sarco TD. Closes tight against steam.
5. *Discharges at steam temperature and vents air and air-steam mixtures at start-up and during operation*
6. *Freeze-proof*—when installed with outlet down, free to drain

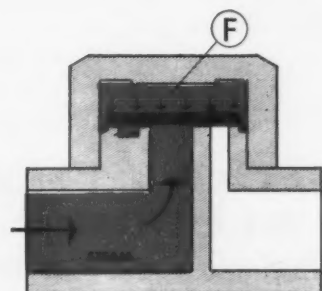


Only Sarco TD Thermodynamic Steam Trap Uses This Unique Operating Principle Which Permits Trouble-Free TD Design

1. Inlet pressure raises disc "A" from seat... immediate discharge of air and condensate at steam temperature.



2. Steam follows the condensate and the high velocity jet across the bottom of disc "A" creates a low pressure area (Bernoulli effect)...the jet is deflected into chamber "F" where it builds up pressure by recompression and this pressure acts on the top of the disc "A"...



3. Pressure in chamber "F", acting on full top area of disc "A", exceeds force of incoming steam and low pressure area under the disc...and immediately forces it down, closing the inlet. As condensation decreases the pressure in chamber "F", the disc rises and steps 1 or 2 repeat.

60-day trial convinces...No obligation...Use coupon!

SARCO

Steam Traps—Temperature
Regulators—Strainers—
Heating Specialties

SARCO COMPANY, INC., Empire State Bldg., New York 1, N. Y.

Please send me Sarco TD Steam Trap and strainer for 60-day trial. Size _____

For installation on _____

Name _____ Title _____

Firm _____

Address _____

City _____ State _____

2184-C



MANY FINE SURFACES REFLECT THE USE OF PFIZER CITRIC, GLUCONIC AND TARTARIC ACIDS

Pfizer Citrates, Gluconates and Tartrates contribute to brightness like you see above. Whether it be through electroplating, cleaning or polishing, these Pfizer organic acids offer many advantages to metal finishers. One big advantage is **NON-TOXICITY**—greater safety for personnel in materials handling. Another advantage is mildness—so necessary in household and specialized industrial cleaners and polishes. Write for *Technical Bulletin 61* which describes in detail the many outstanding uses for **PFIZER ORGANIC ACIDS** in metal finishing.

Manufacturing Chemists for Over 100 Years



CHAS. PFIZER & CO., INC.
Chemical Sales Division

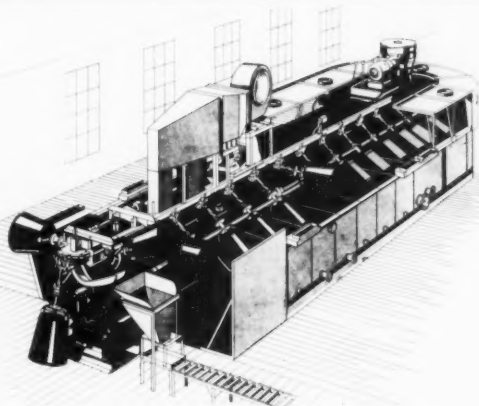
630 Flushing Ave., Brooklyn 6, N. Y.
Branch Offices: Chicago, Ill.; San Francisco, Calif.;
Vernon, Calif.; Atlanta, Ga.; Dallas, Texas

STEVENS

Slants

ON METAL FINISHING

"FROM THE CASTING OR STAMPING TO THE FINAL FINISH"



STEVENS AUTOMATIC BARREL MACHINES

PAY BIG DIVIDENDS TO HUNDREDS OF COMPANIES IN THE PLATING AND PROCESSING OF SMALL PARTS

The list of owners of Stevens Automatic Barrel Machines reads like a page from "Who's Who" in American industry. Motorola, Chrysler, Westinghouse, General Motors, Ford, Illinois Tool Works, Maytag, I.B.M., National Cash Register and General Electric are but a few of the big companies aware of the economic and production advantages of Stevens Automatic Barrel Machines. Countless successful job shop operators are also big boosters.

The Stevens Automatic Barrel Machine provides for the complete metal finishing job in *one* machine. Where exceptionally high production is required, several machines can be used.

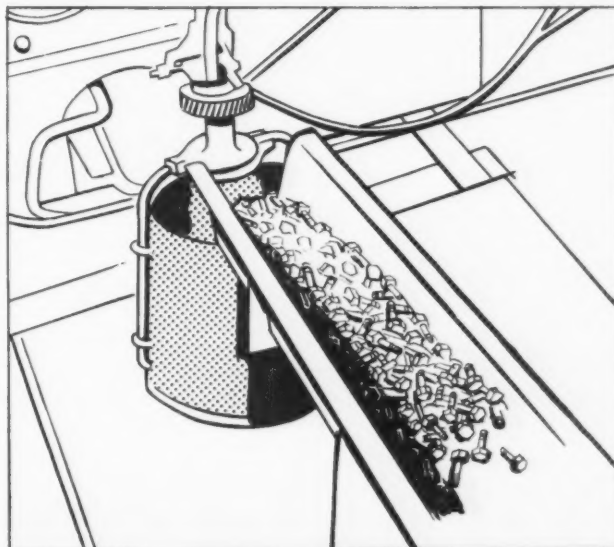
The Drying Unit Is Built In. No separate drying facilities are needed. The machine provides for a complete processing cycle of cleaning, acid, strike plating, rinses, bright dip as well as automatic drying and unloading.

The Machine Is Versatile. Plating time can easily be changed by simple adjustment of a control panel timer. Barrels can be adjusted to dwell or miss certain tanks in the cycle so that different types of work can be accomplished. And when necessary, the complete cycle can be changed by easy modification of the existing machine thereby eliminating costly new capital expenditures.

Dragout Is Reduced. The simple clean construction lines of the Stevens cylindrical barrel reduces carry out of solution far below that resulting from octagonal and older style cylinders featuring panel ribbed construction.

Parts Do Not Become Mixed. Since all parts remain in the plating barrel during the complete processing cycle, mixing of parts is entirely eliminated. Smaller capacity barrels make possible the processing of small emergency loads without the inconvenience of partitioned barrels and without penalizing production.

Machine Is Easily Installed. Most Stevens machines are shipped as one unit, mounted on skids for movement into your plant. Erection time and costs are greatly reduced. Furthermore, all machines are of a size that do not require inside factory alterations. When connections for electricity, steam, water, air, and ventilation are made the machine is ready to go.



Completely Automatic loading and unloading is possible with all Stevens Automatic Barrel Plating and Processing Machines. These are the only barrel machines on the market with this important feature.

STEVENS *Slants* ON METAL FINISHING

NO MATTER WHAT YOUR PLATING OR PROCESSING REQUIREMENTS ARE, THERE IS A STEVENS MACHINE TO DO THE JOB

Stevens Automatic Barrel Machines are now in use for copper, tin, cadmium, zinc and nickel plating. They are also used for cleaning, washing, phosphating, stripping, alroking, lubrifying, and other types of immersion processing.

There are many operational advantages to be enjoyed in the use of Stevens Automatic Barrel Machines. Listed below are but a few.

MINIMUM LABOR REQUIRED — In most cases, one unskilled employee can operate the machine.

HANDLES THE COMPLETE CYCLE — Including cleaning, pickling, chromate treatments, plating, bright dip and is the only automatic barrel plating machine which includes drying.

COMPLETELY AUTOMATIC — No barrel lids to fasten and unfasten during automatic loading and unloading.

BETTER HANDLING — No mixing of parts. Becomes a part of a straight line production system. No partitioned barrels necessary for small loads.

NO HEALTH HAZARD — Occupational health hazards eliminated with ventilation of equipment.

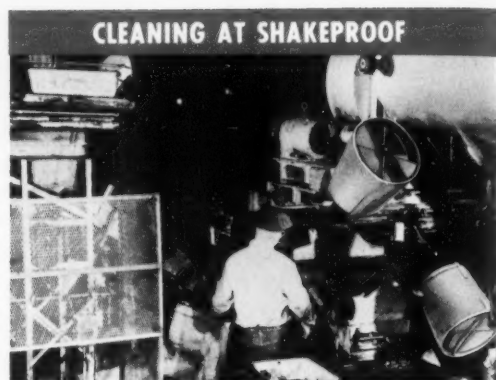
UNIFORMITY OF PLATE — Accurate plating cycles timed to meet your requirements.

FITS ANY PLANT LOCATION — Does not need special buildings — can be moved at any time. Low head room.

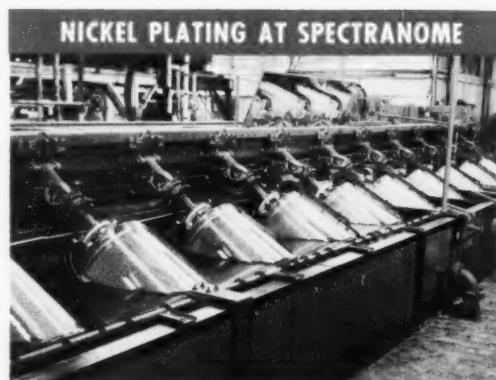
DEPENDABLE — Scores of machines in use. Machine design and construction constantly improved.

LOW INITIAL COSTS — For average operation lowest initial machine costs.

LOW MAINTENANCE COSTS — Proven over years of use and in varied operations.



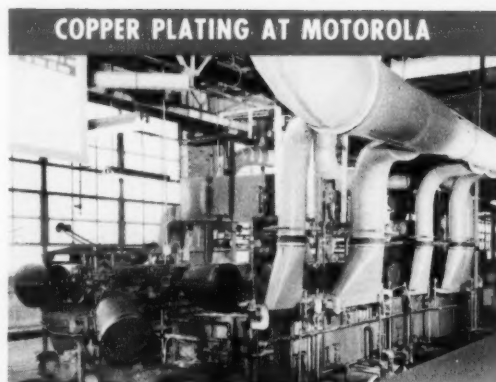
CLEANING AT SHAKEPROOF



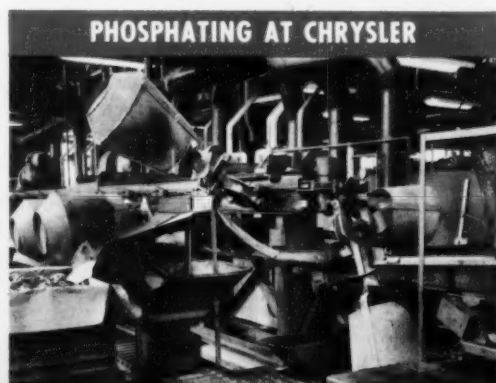
NICKEL PLATING AT SPECTRANOME



ZINC PLATING AT UNISTRUT



COPPER PLATING AT MOTOROLA



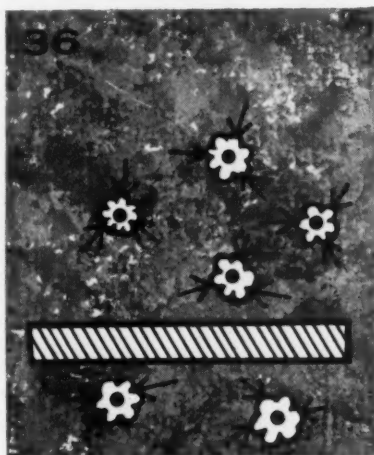
PHOSPHATING AT CHRYSLER



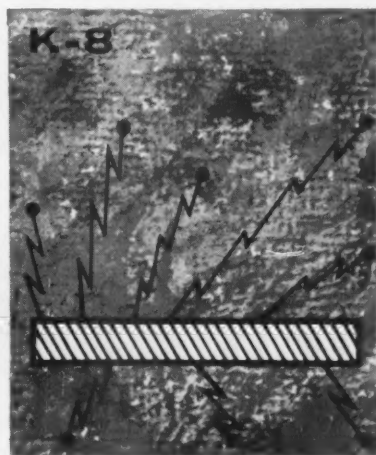
Branches:
Buffalo
Indianapolis • New Haven
Offices in Principal Cities

CONSISTENT, STREAK-FREE PLATING OF STEEL AND COPPER STARTS WITH PENNSALT'S Super-Cycle

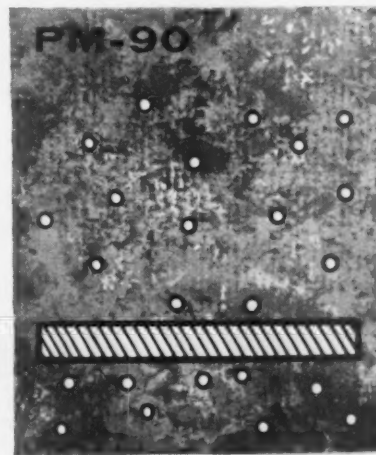
It's the whole cycle, used as Pennsalt recommends, that gives you maximum control over your cleaning line, minimum plating rejects. Here it is:



PENNSALT CLEANER 36. Soak cleaner extraordinary, 36 (as illustrated above) removes more soil, more kinds of soil, than other leading cleaners tested. And soils removed in 36 won't re-deposit on work—sequestering agents keep them suspended.



PENNSALT ELECTROCLEANER K-8*. As shown above, this highly conductive cleaner "blasts" off stubborn pickling smuts with minimum voltages, gets under impacted machining lubricants, prepares base metal for a bright, adherent plate.



PENNSALT PM-90 INHIBITED-ACID PICKLE. After 36 and K-8, the controlled action of PM-90® pickling removes all traces of rust and scale. Balanced composition of PM-90 rids bath of fuming and uncertainty once associated with this operation.

The **whole Super-Cycle** really gives you more than your money's worth in pre-plating preparation. Ask your Pennsalt man or write Metal Processing Dept. 295, Pennsylvania Salt Manufacturing Company. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: 2020 Milvia St., Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

*K-8 IS A TRADEMARK OF PENNSYLVANIA SALT MFG. CO.



Metal Cleaners • Phosphate Coatings • Cold-Working Lubricants

HENDERSON OFFERS THIS 3-PIECE CONSTRUCTION



Save as much as 40%

In all Henderson Horizontal Cast Tumbling Barrels, one of which is shown above, the ends are separate from the body. As the body carries the load, it wears out long before the ends do. For a long time, therefore, with Henderson barrels, you will need to replace only the bodies, merely bolting on the original ends. Compared with the cost of complete new barrels, you can thus save as much as 40%!

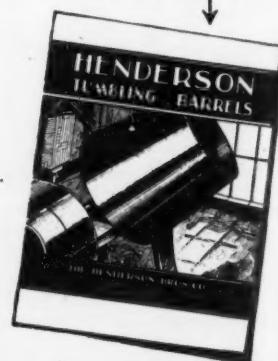
After long experience in the finishing field, we like to recommend cast-iron barrels for most deburring and grinding jobs, but we make rubber, Neoprene, and wood-lined barrels — over 25 types, a barrel for every conceivable finish. Besides the highest quality of material and workmanship, when you buy a Henderson, you get a lot of "know how"!

THE HENDERSON BROS. COMPANY

"The Tumbling Barrel People"

136 SOUTH LEONARD ST., WATERBURY, CONN.

If You're A
"Tumbler"
Send for This
NEW
CATALOG



SINCE 1880 DESIGNERS AND BUILDERS OF TUMBLING BARREL EQUIPMENT



Brighter Plating for You at Lower Cost with these Du Pont Products...

"Cadalyte" Cadmium Plating Salts



The complete cadmium plating salt, designed to simplify the production of any type of cadmium plating. Produces deposits of extreme brightness and uniformity over a wide range of operating conditions with a minimum amount of attention.

"Coppralyte" Copper Plating Salts



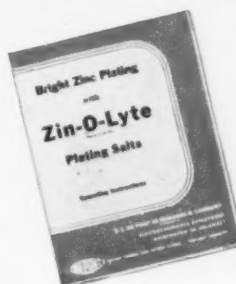
Sodium Formulation and Potassium Formulation — are high-purity, readily-soluble salts containing the correct proportion of ingredients for make-up and maintenance of "Coppralyte" baths.

"Durobrite" Addition Agent 309



A low cost brightener for use in cyanide zinc solutions giving bright, attractive coatings over a wide range of current density. Used in still and barrel plating, it produces high purity deposits highly suitable for use with chromate conversion coatings.

"Zin-O-Lyte" Plating Chemicals



Widely used for low-cost bright zinc plating of all types of steel. High purity, ready solubility and uniformity, make them ideal materials for production of brilliant, rust-resistant zinc deposits directly from the bath —without bright dipping.

...AND EXPERT TECHNICAL ASSISTANCE

You'll find Du Pont's technical assistance one of the most important means at your disposal in producing brighter plating. Whether it's on-the-spot technical service, product literature, or laboratory research, Du Pont has ready facilities to answer your need.

Du Pont Technical Service

In each area, practical plating men are available to give immediate technical assistance. These men have the experience to help you with your operating problems.

Detailed Technical Literature

Operating manuals for economical processes, preparation, and maintenance of plating baths.

Research and Application Laboratories

For help with the more difficult, or unusual problems.

Whether you use barrel, still, semi-automatic or full automatic equipment, Du Pont's long experience in the plating field can be of help to you. The coupon below will bring full details on how you can take advantage of Du Pont's Brighter Plating Service.

ELECTROPLATING

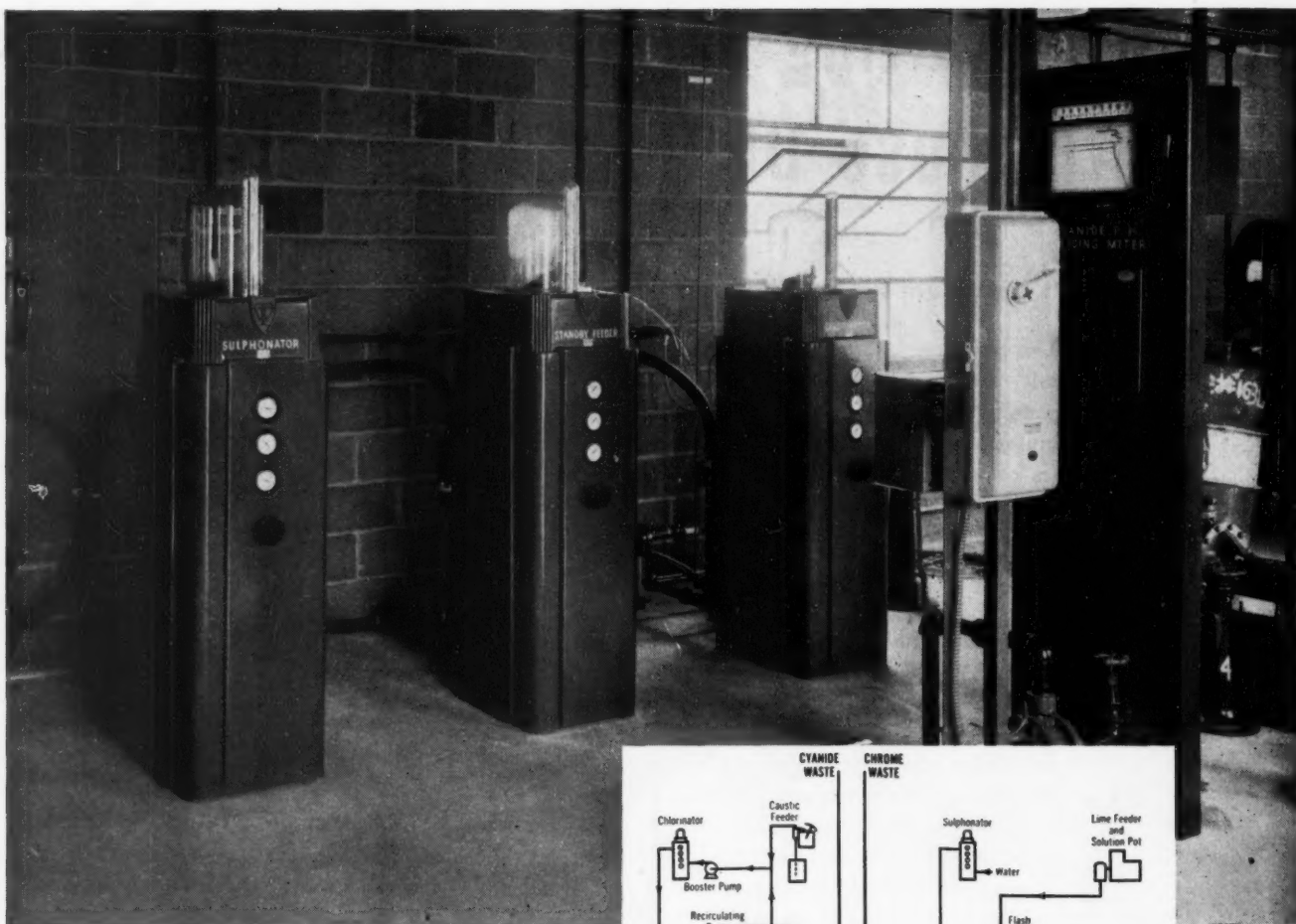
Chemicals • Processes • Service



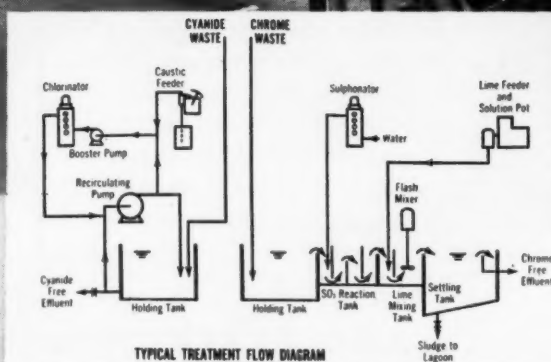
Better Things for Better Living
...through Chemistry

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Department • Wilmington 98, Delaware
☐ Please have a Du Pont Representative call regarding a free survey of my operation. ☐ Send the following books:
☐ "Cadalyte" ☐ "Coppralyte"
☐ "Durobrite" ☐ "Zin-O-Lyte"

Name _____ Position _____
Firm _____
Address _____
City _____ Zone _____ State _____



**DAYSTROM
INSTRUMENT
DIVISION
USES**



W&T *Cyanide & Chrome Waste Treatment*

The Daystrom Instrument Division of Daystrom, Incorporated, located at Archbald, Pennsylvania, has provided a compact and efficient treating plant to destroy the toxic components of their plating waste. The treatment plant has been in continuous operation since 1953.

The cyanide bearing waste is treated with chlorine and caustic, using a W&T Water Diaphragm Chlorinator and a W&T Chemical Solution Feeder. The treatment breaks down the cyanide

to harmless carbon dioxide and nitrogen gas components.

The chromium bearing waste is treated with sulphur dioxide and lime, using a W&T Sulphonator and a W&T Dry Chemical Feeder. The treatment removes the toxic chromium and other heavy metals from solution, to be disposed of as sludge.

If you would like more information on Wallace & Tiernan cyanide or chromium waste treatment, write for bulletin RA-2120-CM.



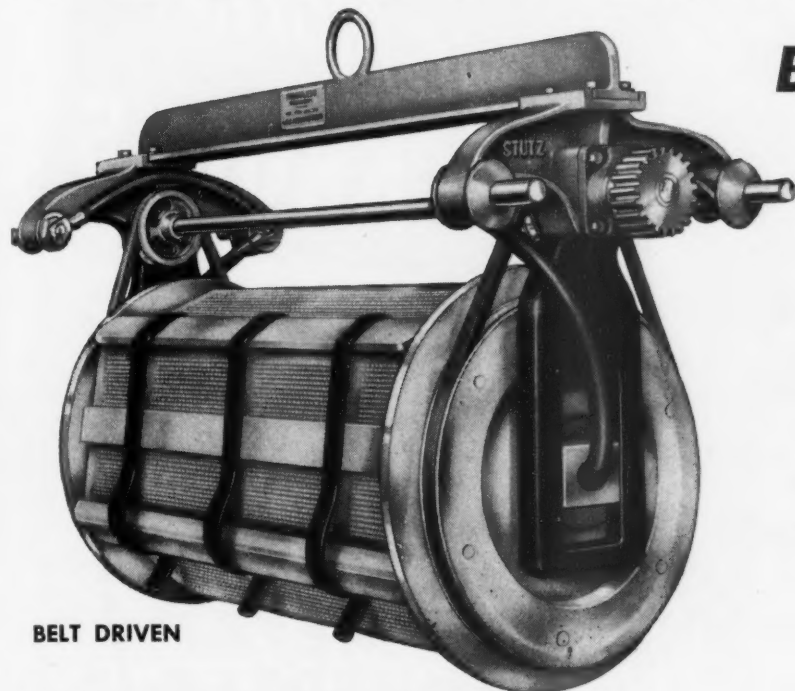
WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

I-52

DESIGN FOR PRODUCTION

BELT DRIVEN PLATING BARREL



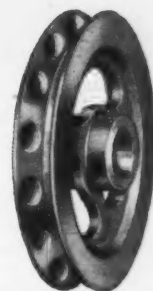
BELT DRIVEN

Greater Current Carrying Capacity Which Lowers Plating Time and Cost . . .

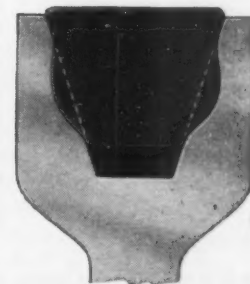
Stutz Belt Drive complete cycle Plating Barrel. This unit incorporates a cylinder of one piece Plexiglas construction, suspended and rotated by two V belts and arranged between cast steel guide frames protected with 5/16" thick special vulcanized hard rubber. For smooth barrel operation, saddle horns are located on 15" centers, 4 provided for maximum current. Cylinder door is heavily reinforced and is locked with vinyl chloride cov-

ered spring steel bung clamps. Cathode contactors are dangle type. These units made to fit most makes of plating tanks and furnished also with motor drives mounted directly on cylinder superstructure. Standard sizes 14"x30" and 14"x36" (I.D.) 12 additional sizes from 12"x24" to 16"x42" (I.D.) Standard perforations 3/32" round on 3/16" centers. Patented dual hole for processing of extremely small parts available.

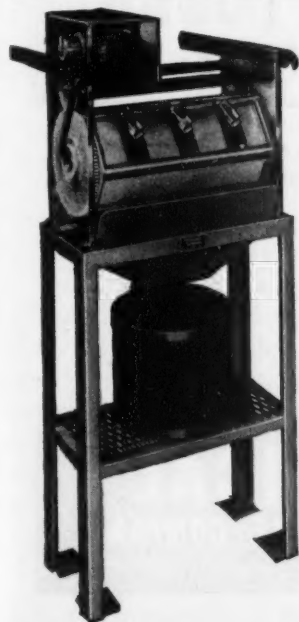
- ★ Lower Initial Cost
- ★ LOWEST Possible Maintenance
- ★ No Cylinder Gear
- ★ No Cylinder Bearings



Specially designed counter pulleys of monel metal with deep dimples for positive grip against belt face.



This shows the belt expanding into the dimples of the driving pulleys. This action provides positive pull with no abrasion to the belt whatsoever.



STUTZ PORTABLE PLATING BARRELS

- The Stutz Portable Barrel is made in 2 standard sizes with cylinders having inside dimensions of 6" x 12" and 8" x 18", I.D., and smaller upon application. Standard openings are 3/32". Smaller or larger openings can be furnished as required.
- Baskets in perforated metals or wire mesh.
- Load/Unload Stand for convenient and fast handling of work load.

Write for Catalog & Prices

GEORGE A. STUTZ MFG. CO.
4430 CARROLL AVENUE • CHICAGO 24, ILL.

"Complete Metal Finishing Equipment & Supplies"

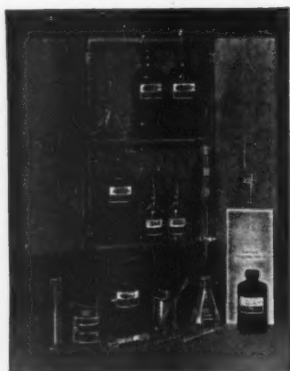
Serving
Industry
35 Years

"Do it yourself"

ANALYZE YOUR SOLUTIONS

with

KOCOUR TEST SETS



- no knowledge of chemistry required
- test sets are complete and ready to use
- readings are direct
- calculations are minimized
- dependable accuracy

When a plating solution is "out of balance," and is giving you trouble, you know that something is lacking . . . but what? . . . and how much? You could have the solution analyzed, but that may take too much time. Perhaps you never considered this, but why not do it yourself . . . in your own plating room . . . It's simple when you have a KOCOUR TEST SET handy. You can do it NOW . . . without delay . . . better than that, you can set up a schedule to make periodic analysis and prevent trouble. KOCOUR TEST SETS are so easy to use that anyone can make the analysis quickly and with dependable accuracy.

Kocour Company developed and sold the first "do it yourself" test set in 1923 and since then has pioneered in control for the plating and metal finishing industry. Here is a partial list of metal treating solutions for which control is available . . .

Brass
Acid Copper
Cadmium
Cyanide Copper
Rochelle Copper
Hi-speed Copper
Chromium
Gold
Iron
Nickel
Black Nickel
Silver
Tin
Acid Zinc
Cyanide Zinc

Chromic Acid Anodizing
Sulfuric Acid Anodizing
Sulfuric-Oxalic Acid Anodizing
Cleaners
Acid Pickles
Coating Solutions
Sealing Solutions
Passivating Solutions
Deburring Solutions
Phosphating Solutions
Heat Treating Solutions
pH Control
Thickness Testing
Metal Identification

"FREE" Let us know what your needs are, and get your free copy of "LAB HINTS FOR THE PLATER." Don't delay . . . write today!

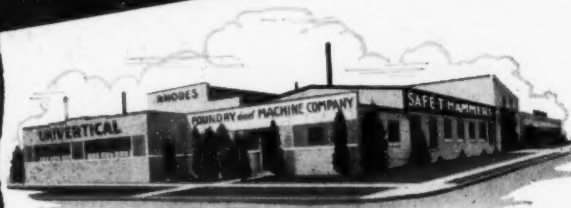
• KOCOUR are specialists and pioneers in testing equipment for controlling plating — cleaning — pickling — anodizing — and hardening processes . . . special sets can be provided for your requirements.

Write today for further information—no cost or obligation.

KOCOUR COMPANY
4802 S. ST. LOUIS AVENUE
CHICAGO 32, ILL.

Specify KOCOUR test sets from your supplier.

Super-Market for ANODES



Buy DIRECT from METAL CONVERTER

Nickel anodes up to 93 inches in length—cast in new shell mold process. This unique method of casting produces anodes of the highest purity—with optimum metallurgical properties. Density of anodes is at a maximum and excellent surface is obtained. These factors account for longer life in plating bath.

NICKEL RECASTING PRICE SCHEDULE
ANY QUANTITY only 99+ purity accepted

15^c PER POUND
FOB UNIVERTICAL
Laboratory Controlled

Write or wire for best price and delivery on the following Anodes:

Copper-Electro Deposited	Phos. Copper
Copper-Cast Round 3" Dia.	White Brass
Copper-Cast Round 2½" Dia.	Zinc
Copper-Cast Beehives	Tin
Copper-Cast Balls	Lead
Copper-Forged Balls	Carbon
Copper-Rolled Oval 1½" x 3"	

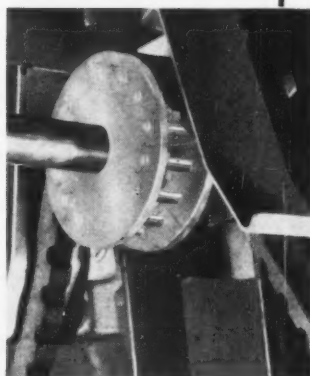
UNIVERTICAL
FOUNDRY AND MACHINE COMPANY

14841 MEYERS RD. • Broadway 3-9000 • DETROIT 27, MICHIGAN

SINCE
1939

Here's why ...

**"G-S"
means
GREATER
SAVINGS:**



U. S. Pat. 2,562,084.
Other Pats. Applied For.

SAVE 100% gear maintenance

Eliminated: cylinder end drive gear, idler gear, pinion gear, 3 bearings. No gears or bearings in solution.

"The Belt-Drive with the Gear Grip"
— Exclusive G-S cogged V-belt and cogged drive-pulley, constant meshed for positive power transmission without gears. Can't slip, creep, vary speed. Cogged-V-Belts steel tensile members won't stretch.

Floating End Plates for constant contact of inverted V-blocks. Can't rock in saddles. More contact.

Adjustable Bearings supporting drive shaft — allow raising and lowering to constant-mesh with all your present motor drives as horns wear.

Floating Hubs with danglers angled downward for constant cathodic contact in center of load. Won't "ride" up on top of load.

Heavier Dangler Cables for higher current carrying capacity, longer life, better operation.

Faster Dangler Cleaning — Slide out hub-lock: 10 secs. Interchange cyls: 5 mins. Cuts hours off usual time.

Total Cylinder Immersion — Prevents gas pockets. Increased current density. Eliminates danger of explosions. Bigger loads, faster plating.

Rugged, All-Welded Cylinders — "H-T Sincolite" or "Tempron" Hard Rubber Heavy-duty, 2" ribs. No "formed" or "molded" sections. Longer life. Best for complete cycles, temps. to 200°F.

Automatic Positioning — Guide channel directs superstructure into operating position, quicker, easier.

Many More Features — 16" more contact area. Up to 30% greater current flow per load. Also available with horn-type contacts (3-point suspension with 4-point contacts. No shorts from burned-out insulation and arcing). Ask for full information now!

The G. S. Equipment Co.

5317 St. Clair Ave.,

Cleveland 3, Ohio

ENdicott 1-0167



Bill and Don Stech of Stech Plating and Equipment, Cleveland.

Platers Swing to G-S for Bigger Profits! Report up to 50% increased production!

Larger loads, faster plating at higher current densities, "through cycle," and longer equipment life, with no down time! You wanted these advantages, and now G-S has incorporated them all in the new Gill-Singleton "Cogged-V-Belt Drive" Plating Barrel. No other equipment can match it, feature-for-feature, at any price. That's why G-S equipped plating plants are out-producing, out-earning all others of comparable floor area and capital equipment investment. Bring your plant up to the new standards of plating production and get bigger returns from your output. G-S can also supply cogged V-belt drive superstructures and cylinders to fit your present tanks.



Write for Bulletin and Price List.

JELCO COP-BRITE

By comparison, it's your
by-far-better copper
plating additive!

The use of JELCO COP-BRITE requires

1. Only your regular copper solution
2. Just ONE additive — Cop-Brite
3. Small additive inventory . . .
economy plus simplicity
4. Low make-up and replenishment
additions
5. Standard plating equipment
6. Only ONE additive, Cop-Brite, for both
Barrel & Still Solutions

The use of any other brightener requires

1. Special copper solution
2. From 2 to 5 additive materials
3. Large additive inventory . . .
high operating costs
4. Large make-up and replenishment
additions
5. Special plating equipment
6. Different additives: one series for Still &
one series for Barrel Solutions

Cop-Brite . . . Operation-proven. Needs minimum maintenance . . . Provides maximum economy

Write
for full
information



JELCO FINISHING EQUIPMENT CORP.

153 East 26th Street • New York 10, N. Y.

Telephone: LExington 2-3055

Rhodium ELECTROPLATING SOLUTIONS

Rhodium Plating for jewelry offers the advantages of
whiteness, lustre and corrosion resistance . . .

For electrical and other applications: protection from
corrosion in air or unusual conditions . . . Particularly
recommended for printed circuits and contact surface . . .

Can be applied to many surfaces from less than one
to one hundred milligrams per square inch . . .



Consult our staff, without
obligation, about your
specific plating problems.



SIGMUND COHN MFG. CO., INC.

121 SOUTH COLUMBUS AVENUE • MOUNT VERNON, NEW YORK

Specialists in the
Unusual—Since 1901

Facts to consider when you're buying

Chromate Conversion Coatings

for Corrosion Protection, Paint Base, Decorative Finishing

WHAT IS IRIDITE®

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a nonporous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

If your company is manufacturing or buying parts or complete assemblies made from or plated with any of the more common non-ferrous metals—zinc, cadmium, aluminum, magnesium, silver, copper, brass or bronze—you've probably already run up against the question of finishing these surfaces with a chromate conversion coating. These coatings are used to protect against corrosion, or to provide a base for paint or to provide a decorative finish for sales appeal or shelf life. Since chromate conversion coatings represent a relatively new means of obtaining these finishes, this digest of facts to consider may be of value to you.

1. THE COATINGS THEMSELVES.

There are many brands on the market. All are similar in many ways. Each, of course, offers its own specific advantages and these may relate to operating techniques, performance under actual use conditions, cost, availability, etc. Naturally, you'll want to choose a coating that is widely known and accepted under both military and civilian specifications.

2. THE COMPANY BEHIND THE PRODUCT.

Is it a reliable, established organization? Does it offer experienced technical service, both from the field-engineering organization as well as the home office and laboratories? The man who sells and services your installation should be thoroughly familiar with not only chromate conversion coatings and their applications, but also with the characteristics and performance of related finishing operations such as pre-cleaning, electroplating, painting, etc. This is most important since all steps of the finishing cycle must be functioning properly for the satisfactory performance of the ultimate finish produced.

3. AVAILABILITY OF THE PRODUCT.

Ideally, of course, the material should

be readily available to you from nearby warehouses to avoid time loss in long distance shipping and to provide emergency service, should the need arise.

4. COST. Naturally, the initial price of the material is important to you. However, just as you consider ultimate cost when you are buying mechanical equipment, ultimate cost must be considered for these finishing chemicals. So, it will pay you to investigate consumption costs, labor costs and the other factors which go into the determination of ultimate cost. Further, cost alone gives no indication of product performance, so careful attention must be given to the purpose the finish must serve and the value that finish will add to your product.

5. FACILITIES FOR RESEARCH AND DEVELOPMENT. Perhaps the existing types of chromate conversion coatings do not include a compound that will accomplish exactly what you wish. Then, it is important to deal with a supplier who has adequate research and development facilities available to work with you to produce a material to meet your needs. Naturally, such a project is seldom completed overnight. But, with complete cooperation and confidence from both you and your supplier, chances are a satisfactory program can be completed.

These are the concepts of sales and service on which we, Allied Research

Products, Incorporated, have developed and marketed the line of Iridite chromate conversion coatings... superior product performance, complete sales and technical service, easy product availability, economical cost, extensive research and development facilities. No doubt you are familiar with our line and have seen this trademark—

IRIDITE®

—in our advertising, technical literature or on shipping containers in your plant. Remember this trademark when you're buying or investigating chromate conversion coatings for your company. It's your assurance of quality, economical products from a reliable and established company, skilled sales and technical service from both our home office and a national network of representatives, immediate availability from warehouses in strategic industrial areas and our willingness to work with you to develop new finishes to meet your needs, should the present line fall short.

For complete information on Iridite chromate conversion coatings, write today for your free copy of our technical data file. Or, for immediate advice, call in your Allied Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

ALLIED RESEARCH PRODUCTS
INCORPORATED

4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

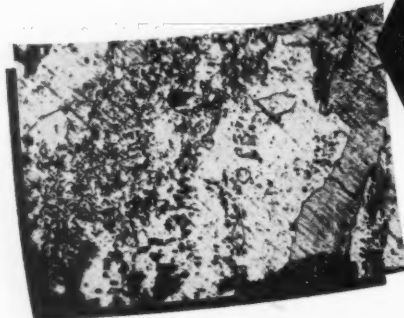
Manufacturers of Iridite chromate conversion coatings for corrosion resistance, paint systems, final finishing of non-ferrous metals; ARP Plating Brightener & Chemicals. West Coast Licensee—L. H. Butcher Co.

3 STANDARD SHAPES

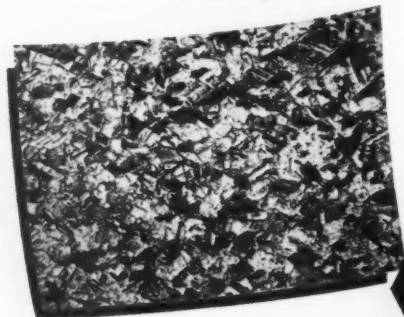


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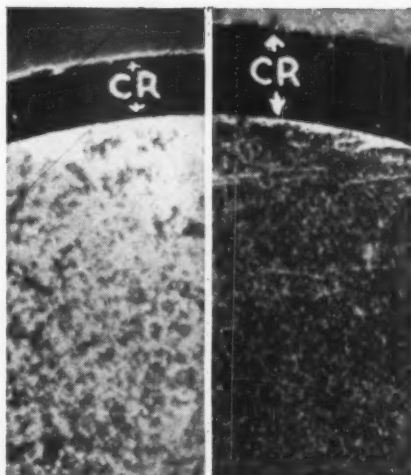
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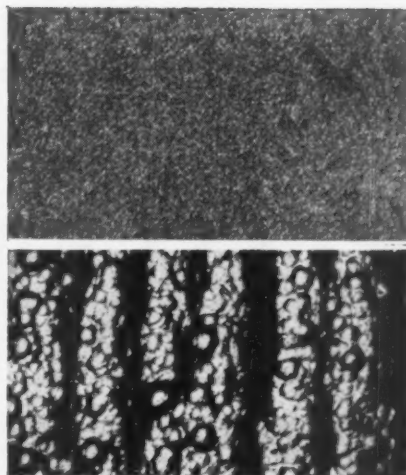


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Macrograph of steel rod cross section at left with 0.016" chromium deposited in 16 hours by ordinary solution. Identical rod section at right in SRHS under identical conditions got 40% thicker deposit.



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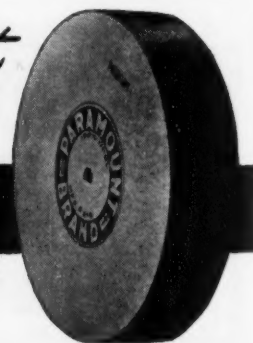


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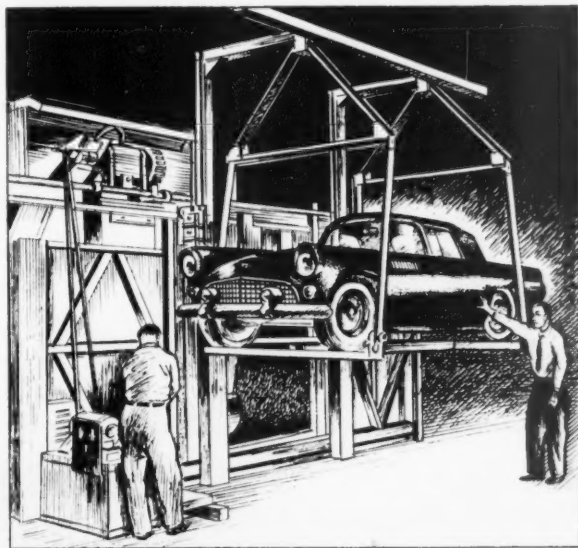
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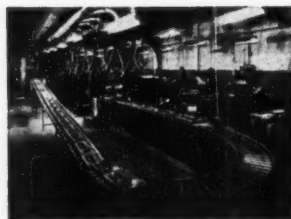
tem may be incorporated. While standard capacity is 1000# per lift, substitution of a heavy duty rack increases efficient load capacity 50%.

Mr. Wagner explained some details of the production tooling program which has been inaugurated to turn out this improved, much heavier but precision plating machine. All details are interchangeable, precision drilled and machined and pre-assembled; no drilling is done on final assembly in the customer's plant, (except in some instances where a drill jig is used.) Every part is drilled, reamed, tapped and milled in special coordinated fixtures; sections are assembled in giant jigs and are designed for fool-proof self-alignment. Machines may be lengthened or shortened to suit long term production changes, as tanks and lift mechanism may be shifted without difficulty; parts and entire sections may be replaced. A single hydraulic power unit is interconnected to two hydro-motors, the source of power for all lift and transfer operations; micro adjustment of acceleration and deceleration permits work carriers to be lifted, transferred and deposited gently without vibration, jarring and loss of parts.

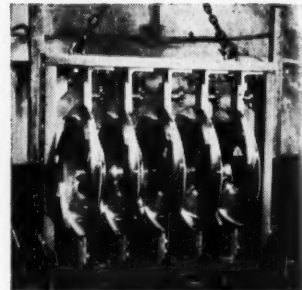
As proof of the simplicity of installation, Mr. Wagner stated that the first of the heavier, modular type automatics was installed as a pre-nameling system for a large stove manufacturer. Approximately 113' in length, the machine was dry cycling four days after delivery, needing only routine adjustments. He also pointed out that altho the lift raises to only 13', an advantage in plants of normal ceiling, the machine is capable of handling 100 racks per hour, approximately 100 pounds per rack. The Wagner Brothers Dix Avenue Plant in Detroit is devoted exclusively to quantity production of automatic plating systems, tanks and germanium and selenium rectifiers. Full details on the automatic are contained in a technical bulletin, copies of which may be obtained by writing 418 Midland, Detroit 3.

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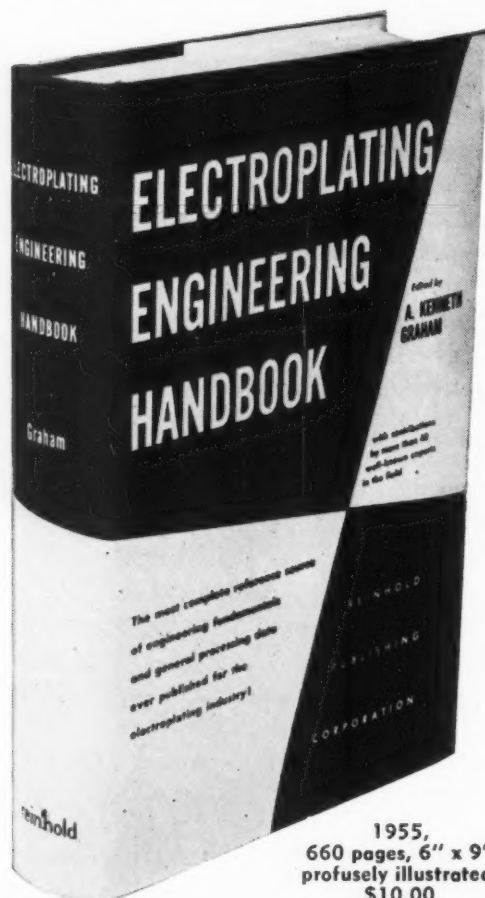
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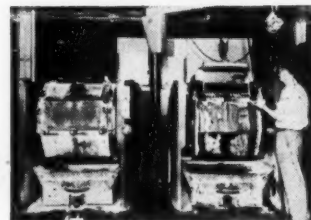
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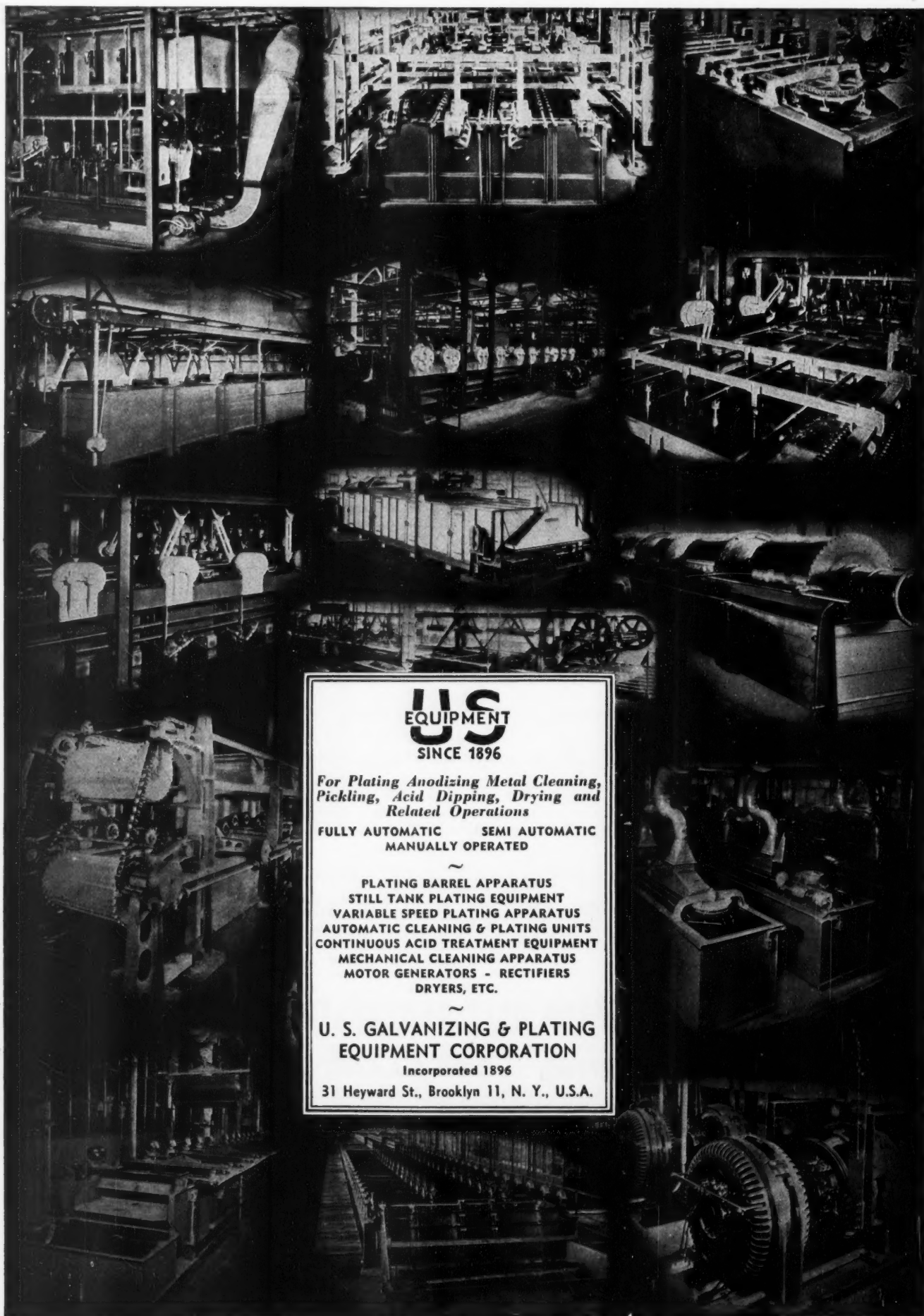
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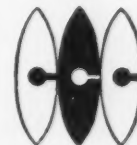
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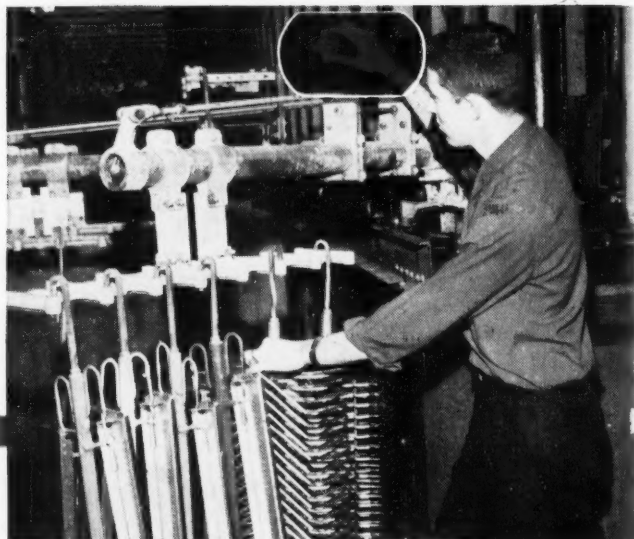
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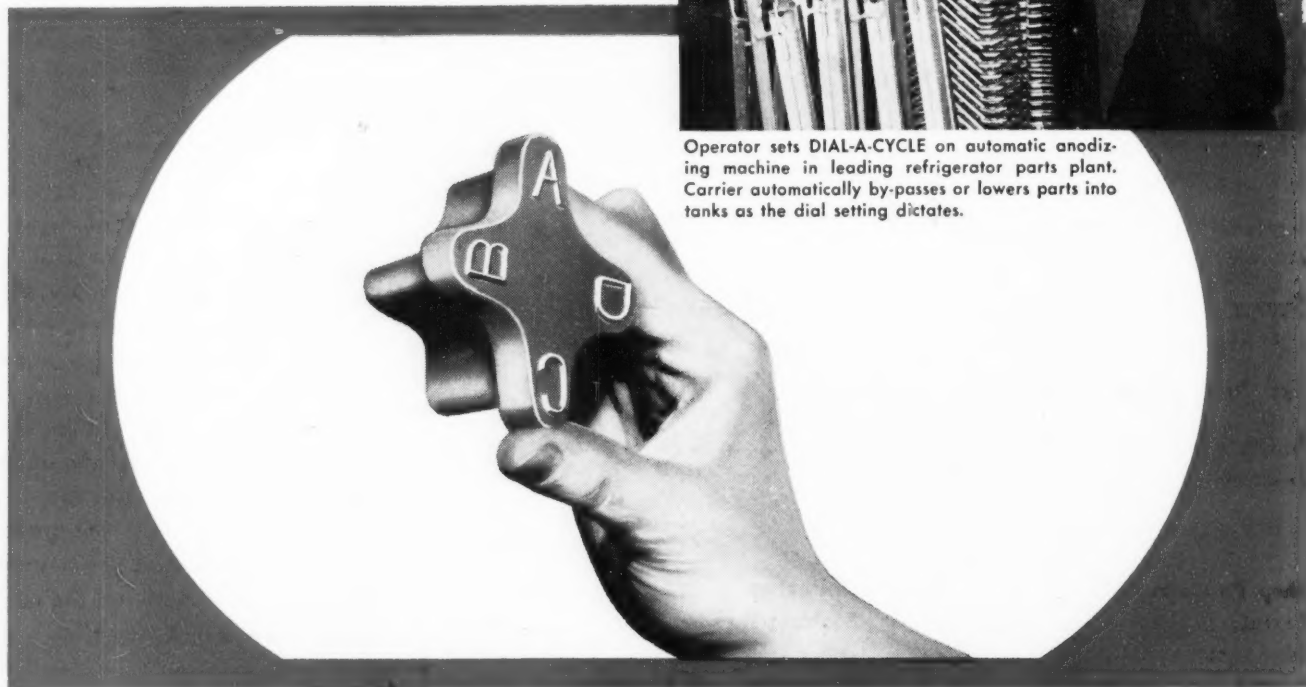
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Cyanide in Wastes

In practically every state where treatment of industrial wastes is required before discharge to public waters, the presence of even an infinitesimal amount of cyanide is prohibited. Unfortunately, cyanide which is generally considered the ultimate in toxicity among chemical compounds is also the basis of an important percentage of metal finishing operations. Therefore, the problem of reducing its concentration in wastes to a permissible figure, understandably, has been the subject of extensive investigation.

The earliest method of treatment consisted in liberating deadly hydrocyanic acid gas by addition of strong acid and venting to the atmosphere through a high stack. This was, obviously, a dangerous as well as expensive process. Treatment with polysulfide required high temperatures and resulted only in conversion of the cyanide to thiocyanate. Every plater knows that cyanide is decomposed during operation of his plating solutions, so it is not surprising that electrolysis with insoluble anodes was hopefully considered for waste treatment, especially since the necessary equipment usually is already available. However, the cost of power and of high temperature maintenance, added to the lengthiness of the treatment period, has mitigated against its wide adoption. Oxidation with air has not been noticeably successful, but the use of ozone, although expensive, looks sufficiently promising to warrant further research, which is now in progress. Ion-exchange methods suffer from the disadvantage of incomplete removal when the cyanide concentrations are high and, unless the recovered cyanide is in reusable form, it still presents a disposal problem.

Among the ten methods known, the most feasible at the present time is oxidation with gaseous chlorine or chlorine-bearing substances such as hypochlorite, the latter being preferred for small or batch-type installations because of greater convenience and less expensive feeding equipment. Although chlorination is almost universally used today, its action is not complete in certain instances, and the need still exists for a process which is simple, requires a minimum of equipment, and is practically foolproof.

There appears to be some hope in a new process which, surprisingly in view of the high toxicity of cyanide, uses certain live bacteria as an active agent in elimination of this compound. Already established on a laboratory scale at the Academy of Natural Science in Philadelphia, the process enables solutions of over 100 ppm to be reduced to practically zero. Further investigation is being conducted to determine optimum conditions and to develop pilot plant and finally plant-size operations. Should the end results come up to expectation, there will be available to the plater a solution to his cyanide disposal problem which should be within the resources of even the smallest plant.

Nathaniel Hall

LEVELING NICKEL

By Dr. D. Gardner Foulke

Hanson-Van Winkle-Munning Co., Matawan, N. J.

THE importance of the relatively recently discovered property of nickel plating solutions, the ability to level or smoothen the basis metal, is now world-wide. Because leveling baths can reduce costly finishing operations and since the newer processes can be operated to give bright deposits of very high current densities and still effectively level, industry is finding that leveling nickel solutions offer real production advantages. Data have been obtained by several groups of workers on the effect of plating variables, i.e. current density, temperature, pH and agitation, upon the degree of leveling obtainable. A consideration of these data shows that leveling is the result of increased polarization at the peaks as compared to the polarization in the valleys, leading to a new theory of leveling based upon a difference in thickness of the diffusion layer at different points on the cathode. Photomicrographs indicate that the type of deposit obtained in the crevice differs from that obtained at the peak and polarization data show that addition agents which are effective leveling agents tend to greatly increase the cathode polarization.

There is some evidence, as yet by no means complete, that duplex coatings, i.e. a leveling deposit followed by a bright nickel deposit of the laminar type, more typical of bright organic coatings, will provide better corrosion resistance. Where the leveling and bright solutions are fully compatible and, should additional evidence be obtained showing that corrosion resistance is better, the additional engineering and space resulting from an added step in the cycle might well be justified, particularly in view of the shortage of nickel and concomitant strong desire to use as little as possible.

In any event, the use of high-speed, bright, leveling nickel plating processes is in the ascendancy and, in addition to the property of leveling, industry is demanding deposits of low stress, good ductility and corrosion resistance.

Introduction

The importance of the relatively new characteristic

of plating processes, that of leveling, continues to grow in the metal finishing industry not only in the United States, but all over the world where any considerable amount of plating is done. Evidence of this may be found in the frequent reference, in technical publications, suppliers' releases, and the patent literature, to the leveling ability of nickel, copper, chromium and other plating solutions.

The reason for this interest is quite understandable. Any process or procedure which will reduce costly mechanical finishing operations is viewed with interest by industry and, of course, accomplishing this as part of a step which is in the cycle of operations anyhow is a very reasonable approach indeed.

Undoubtedly the most comprehensive story on leveling up to 1950 was told at the AES Convention of that year and recorded in the 37th Annual Proceedings. These papers had the effect of drawing the platers' attention to the methods of measuring micro-contours, to methods for effecting leveling in the plating bath either by virtue of bath composition or by other

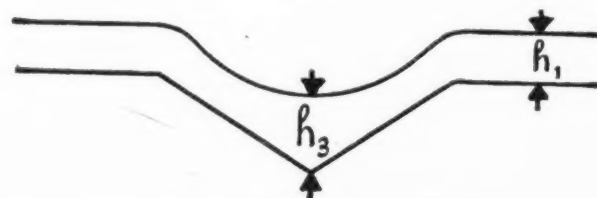


Fig. 1. Diagram Showing Method of Determining Thickness Ratio.

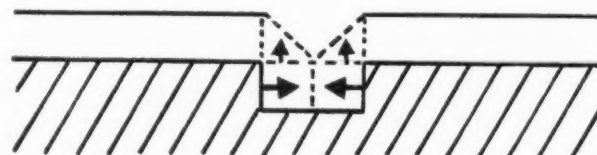


Fig. 2. Diagrammatic Leveling with Thickness Ratio = 1.

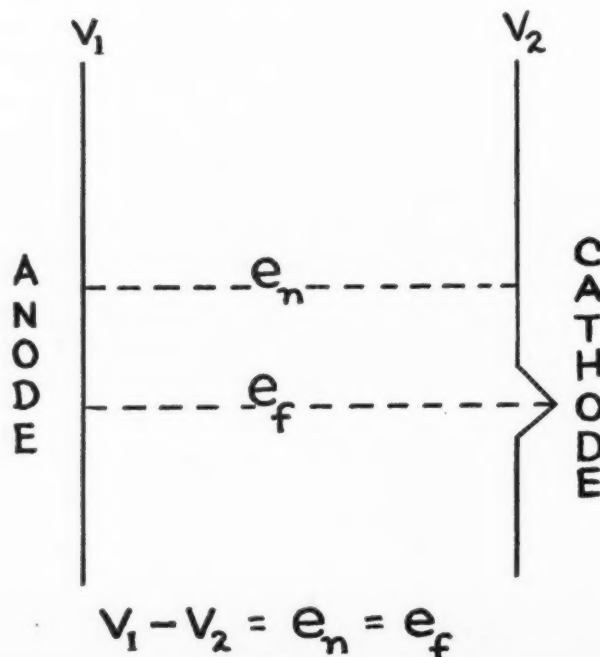


Fig. 3. Potential Relationships for Microprofile.

means such as the PR process, as well as to other methods such as electro- and chemical polishing.

Since 1950 considerable progress has been made in this general field both from the standpoint of theory and practical application and, once again, as has been true so often for the plating industry, by far the greatest advance has been in the field of nickel plating, both from the viewpoint of process improvements and gallonage being used. This interest has not been limited to suppliers and to industry as users, but much work has been done in the research laboratories of the larger users of plated coatings as, for example, the automotive companies. The AES has established a project at the University of Virginia on microthrowing power which is so closely related to leveling that the mechanism of both phenomena can be explained on the same basic premise, that the rate of diffusion into crevices is smaller than for peaks or flat surfaces.

What is meant by leveling can be shown by referring to Fig. 1. When h_3/h_1 or h_2/h_1 is unity or greater, leveling has occurred. We have found that, at low current densities, nickel, acid copper, and even cyanide

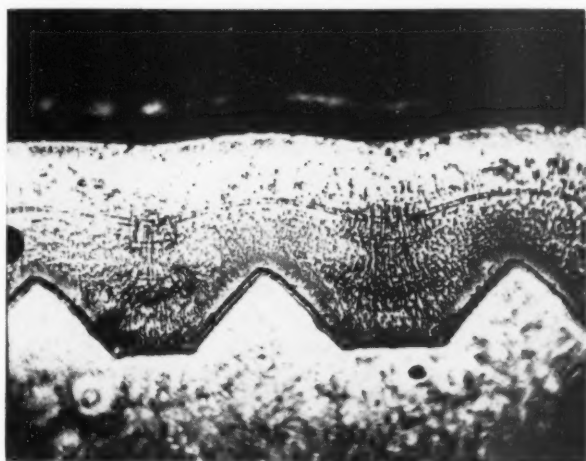


Fig. 4. Typical Leveling and Structure Obtained with Acetylenic Addition Agent — 500x.

baths produce deposits with a h_3/h_1 ratio of unity and, under such circumstances, leveling will occur. However, even at low current densities, this ratio is only unity and limited actual leveling occurs, although consideration of Fig. 2 shows that when the ratio $h_3/h_1 = 1$, a 1 x 2 mil scratch would be filled by a 1 mil deposit, demonstrating that leveling is possible under such conditions. If the current density at each point is the same then the two sides will fill up and meet but, meanwhile, the deposit is building upward at the same rate as on the surface. This has been exaggerated to make a point. The h_3/h_1 ratio must be considerably greater than unity to provide leveling of value commercially.

On the occasion of the 1954 AES Convention *B. Ostrow* and *F. Nobel*, when discussing leveling in cyanide and acid copper solutions, referred to negative and positive leveling. They stated that the prime contributing factor to positive leveling was due to increasing the potential between the hills and valleys by polarization. Fig. 3 shows that the potential differ-

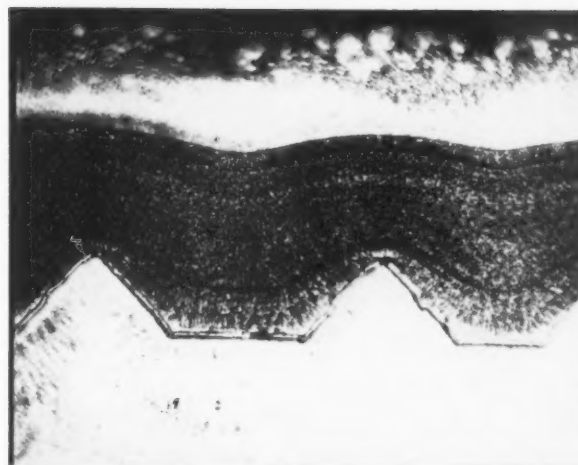


Fig. 5. Leveling and Structure Characteristic of Acetylenic with Class 1 Brightener — 500x.

ence between the anode and either the base of the scratch or the top of the scratch must be the same, since both anode and cathode are conductors and have substantially equipotential surfaces. Then,

$$\begin{aligned} e_n &= e_f \\ \text{and } e_n &= i_n R_n + P_n \\ e_f &= i_f R_f + P_f \end{aligned}$$

Obviously, $R_f > R_n$, but the difference between R_f and R_n is very small for microprofiles and only a small increase in P_n can throw more current into the recess with the result that there is an increase in metal build-up in the scratch. In the case of nickel solutions free of addition agents (Watts') just a small increase in activation polarization may well account for the fact that h_3/h_1 values of unity can be obtained. In order to obtain good leveling it is necessary to increase the cathode polarization by use of an addition agent. If the polarization (brightener concentration) in the scratch, P_f , is the same as that for the surface, P_n , it is apparent that i_f cannot exceed i_n because R_f is always greater than R_n . However, there is reason to believe that the effective thickness of the diffusion layer is greater for the crevice than the peak. Therefore, diffusion of the addition agent into the crevice is slow compared to the transport to the

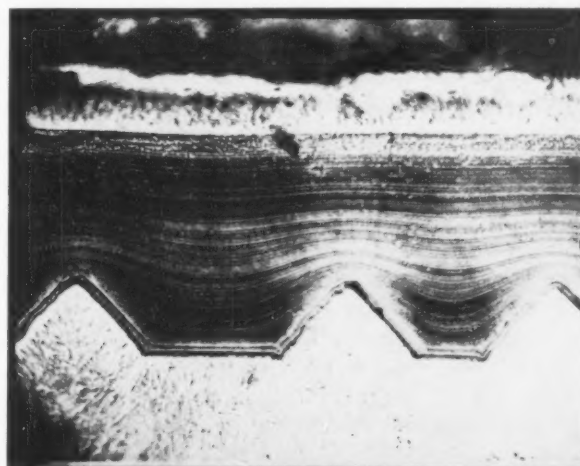


Fig. 6. Structure of Deposits with Three-Fold Normal Acetylenic Brightener and Class 1 Brightener — 500x.

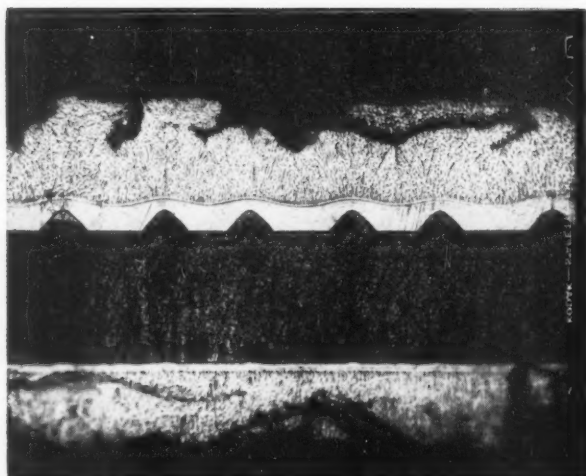


Fig. 7. Leveling Obtained at 29 amp./sq. ft. — 250x.

surface or peak. Consequently, the polarization in the recess will be considerably smaller than at the peak and more metal will be deposited in the valley. Data being accumulated in our laboratory support this concept and were the basis of a recent series of papers.¹ Simple evidence to support this view is found in Figs. 4, 5, and 6, which show the leveling action of the acetylenic type of addition agent. The structure of the electrodeposited nickel at the base of the scratch is different from the structure deposited by I_n . In the valley the deposit is columnar, while at the high points the typical laminar structure of bright nickel deposits on macroprofiles obtains.

Using specific bath formulations and conditions, it is possible to obtain fully bright electrodeposits at relatively high current densities. These deposits have attractive leveling characteristics as shown in Table I. An electroformed roughness standard was submitted for plating with 1 mil from a leveling solution and, after plating under typical operating conditions (150°F., 72 amp./sq. ft., pH-2.8), it will be observed that rather spectacular leveling was achieved in the roughness normally considered the basis for leveling deposits. These data also point up the smaller degree of leveling possible for very rough surfaces, i.e. those approaching macro-surface profiles, in which cases the thickness of the diffusion layer is essentially normal. Where very rough surfaces are plated by leveling nickel there are two factors to be considered. First the polarization differences between top and bottom of the crevice is less and, of course, the amount of metal which must be deposited in such a large crevice is very great, so that instead of 1 mil deposit a much thicker deposit will be required before much leveling can be effected.

The ability of the acetylenic type addition agents to level at relative high current densities (Table I) has permitted bath modifications to be adopted to provide for high speed plating. This is accomplished by use of higher temperature, a relatively high nickel chloride concentration and air agitation. Nickel chloride values of the order of 12 to 15 oz./gal. are compatible with the brightener and the stability of the acetylenic type addition agent is such that air agitation poses no oxidation problems. On the other hand, both from the standpoint of solution maintenance and brightener

TABLE I

Leveling Results on Electroformed Roughness Standard

RMS of Standard	RMS with 1 Mil Leveling Deposit	Per cent Leveling
20	1	95
50	9	82
125	70	44
500	390	22

TABLE II

Effect of Variation in Current Density on Scratch Filling Characteristics of Leveling Bath

Temperature: 60 C. pH: 4.0

Current Density, (amp./sq. ft.)	Mm. Depth of Scratch After 4 amp.-hrs.
Control	(0.115)
20	0.027
40	0.037
80	0.077

TABLE III

Effect of Variation in Current Density on Per Cent Leveling of Acetylenic Type Bath

Temperature: 160°F. pH: 3.0

Current Density, (amp./sq. ft.)	Percent Leveling (0.7 Mil Deposit)
10	83
30	75
50	66
70	58
90	50

TABLE IV

Effect of Variation in pH on Leveling Characteristics of Acetylenic Type Bath

Temperature: 153 F. 1 mil @ 60 amp./sq. ft.

pH	Percent Leveling
4.0	80
3.0	80
2.5	75
2.0	43

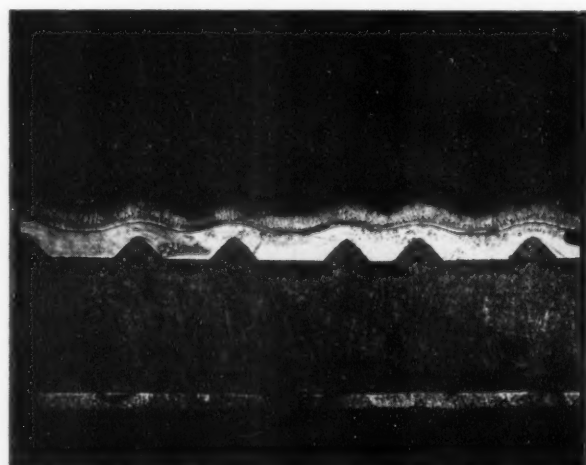


Fig. 8. Leveling Obtained at 58 amp./sq. ft. — 250x.

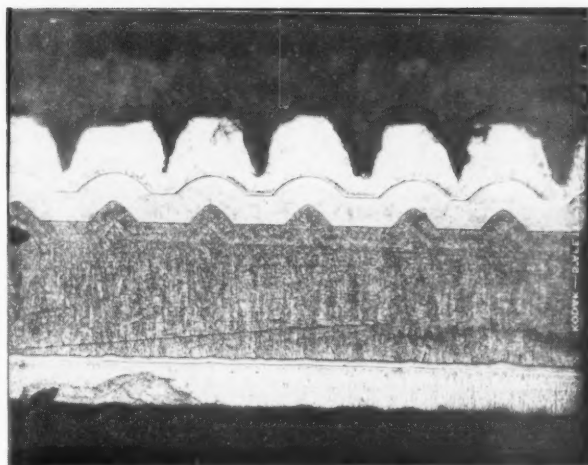


Fig. 9. Leveling Obtained at 116 amp./sq. ft. — 250x.

oxidation, the anode current density should not exceed 25 amp./sq. ft. for best results. It should be mentioned that the stress can be maintained near zero or slightly compressive as desired.

The deposits obtained from the earlier leveling solutions were semi-bright rather than full bright as is possible now. However, the mechanism is believed to be the same, be the deposit bright or not. Conse-

TABLE V

Effect of Variation in pH on Scratch-Filling Characteristics of Leveling Bath

Temperature: 60 F. 1½ Hr. @ 40 amp./sq. ft.

pH	Final Depth of Scratch, mm.
Control	(0.115)
1.5	0.060
1.8	0.050
2.5	0.027
3.0	0.020
4.0	0.017
2.0*	0.12
4.0*	0.10

* Watts' Bath

TABLE VI

Effect of Variation in Temperature on Scratch-Filling Characteristics of Leveling Bath

Current Density: 40 amp./sq. ft. pH: 4.0

Temperature, °C.	Depth of Scratch After 90 Minutes of Plating
Control	(0.13) mm.
10	0.096 "
30	0.033 "
45	0.021 "
60	0.014 "

TABLE VII

Effect of Variation in Temperature on Leveling Characteristic of Acetylenic Type Bath

Current Density: 40 amp./sq. ft. pH: 3.0

Temperature	Percent Leveling 1 Mil
120	65
150	74
160	79
170	84

quently, the effects of plating operating variables, i.e. pH, current density, temperature, etc. in general are the same.

Effect of Variables

In considering the effects of variables upon the leveling process it should be kept in mind that leveling, whether it be by elimination of projections or by filling in of scratches is explainable by the same basic mechanism — a difference in diffusion layer thickness. As a matter of convenience, reference will be made generally to peak and recess which will normally bring to mind a scratch or micro-gouge.

CURRENT DENSITY:

An increase in current density will result in a slower rate of leveling. This is shown for two types of leveling agents in Tables II and III. In the first case a standard scratch (0.115 x 0.12 mm.) was plated for 4 ampere-hours in a bath containing coumarin and it can be seen that considerable more rapid scratch filling occurred at 20 than at 80 amp./sq. ft. These data were presented by Leidheiser² at the Deutschen Bunsen-Gesellschaft in May 1955. The data in Table III show that the same effect is found for the acetylenic type of leveling agents. In this case, the data were obtained using a surface analyzer and reported as per cent leveling, i.e. roughness at start minus roughness at end X 100 divided by roughness at start. Typical deposits obtained at 29, 58 and 116 amp./sq. ft. shown in Figs. 7, 8 and 9 show the decrease in leveling with increase in current density. It might be added that Dow and Stareck³ have reported that "crack-free" chromium levels a great deal more than ordinary chromium (21% vs. 4.5% for 0.005") but no data with respect to the effect of current density or any of the following variables were given.

pH:

In our laboratory we have found that an increase in pH (see Table IV) will increase the leveling. Similar data have been reported by Leidheiser (Table V) on the basis of scratch filling. Of course, it is apparent that a factor other than relative amounts of brightener

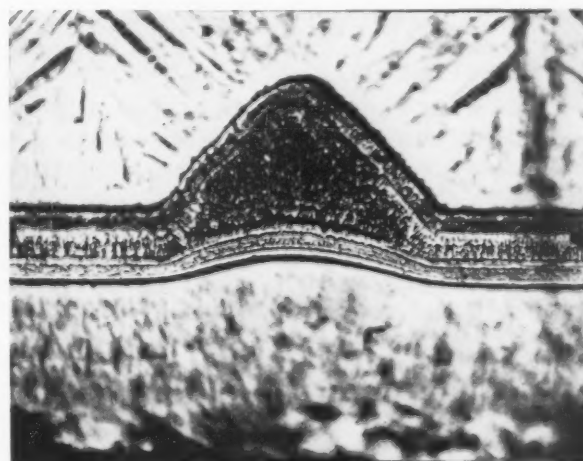


Fig. 10. Typical Duplex Coating.

TABLE VIII
Effect of Stirring on Leveling Obtained

Bath	Amount of Addition Agent	Stirring	h_2/h_1	Temp., °C.
Watts'	10 ml./l	yes	3.3	50
Watts'	10 ml./l	no	3.3	50
Watts'	4 ml./l	yes	1.37	25
Watts'	4 ml./l	no	1.12	25

TABLE IX
Cathode Polarization in Unagitated Bath

Addition Agent Ml./l	Temperature °F.	C. D. amp./sq. ft.	Cathode Potential, mv. vs. Sat. Calomel Cell
0	120	5	710
—	—	25	776
—	—	50	810
—	—	100	844
4	120	5	793
—	—	25	830
—	—	50	862
—	—	100	893
0	75	5	814
—	—	25	895
—	—	50	930
—	—	100	945
4	75	5	833
—	—	25	895
—	—	50	930
—	—	100	954

present at the peak and in the recess comes into play. Certainly the cathode efficiency must also be considered, decreasing as it does at lower pH values.

TEMPERATURE:

It has been reported that higher temperatures make for better leveling. Leidheiser's data (Table VI) definitely show this trend for the scratch-filling property of a coumarin-containing bath. Data obtained in our laboratory (Table VII) in general supports this although some divergent results have been obtained which indicate the effect of temperature may be somewhat complex, acting as it does upon a number of variables such as conductivity, diffusion, etc.

AGITATION:

Agitation has somewhat the same effect as an increase in addition agent concentration by virtue of a more rapid transport into the cathode film. Table VIII shows the effect for stirred and unstirred nickel baths containing an acetylenic type brightener. When this addition agent was present in high concentration, stirring made no difference. *Safranek* and *Faust*⁴ re-

ported agitation increased the leveling obtained with bronze solutions.

CATHODE POLARIZATION:

It is generally known that leveling is associated with an increase in cathode polarization. Leidheiser claimed that the increase must be of the order of 100 mv. to insure leveling in contrast to the increase of polarization caused by brighteners as a class for which the increase is 10-30 mv. He reports that considerable increase in cathode potential was accompanied by an increase in scratch-filling ability for coumarin and ethylene cyanohydrin. Data for acetylenic leveling agents indicate that the increase in cathode polarization with respect to a Watts' bath as a reference solution to obtain leveling is not necessarily of the order of 100 mv. (Table IX), although it must be added that the method for measuring the cathode potentials was not highly refined since relative values were of most interest.

DUPLEX COATINGS:

No discussion of leveling would be complete without some mention of duplex coatings. A typical example of this type of coating is shown in Figure 10. Obviously, there are production objections to the use of duplex coatings if leveling can be effected in a bath which yields fully bright deposits. However, if some advantage can be shown to result from such a schedule and if the bright and semibright baths are completely compatible, and the adhesion of the second layer to the first is good, there is justification for considering such a cycle.

One of the best reasons for the use of duplex coatings would be evidence of better corrosion resistance. Preliminary studies in our laboratory indicate that this may be true and at least one study in the field, wherein a 1 mil coating of 80% of semi-bright nickel followed by 20% of bright nickel was found to be equal to 1.2 mils of bright or semi-bright-nickel, tends to confirm this possibility. Interesting, too, are some data showing deposits of the schedule, undercoat, bright and topcoat, semi-bright, give less satisfactory corrosion protection, than a single coat.

In any event, it is inevitable that leveling type nickel processes will find wider and wider use in the industry and it is just as inevitable that high corrosion resistance, good ductility and low stress will be other properties of nickel electrodeposits demanded by the users of electroplated coatings produced in leveling solutions.

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Cleaning Metals and Alloys

By C. B. F. Young, *President, Apley N. Austin Co., Pequabuck, Conn.*

MANY times this subject has been dwelt upon at length in books, periodicals, research papers, manufacturers literature, etc. In fact, during 1955 there are 47 items dealing with cleaning listed in the index of METAL FINISHING.¹ This, remember, is only one periodical dealing with the phase under consideration. Too many times articles are written which are nothing more than a rewrite of the literature. In the present case the author is endeavoring to make a logical approach to the problem, review the data at hand, obtain new data from an actual plant set up and then do something about the situation.

It should be emphasized that too often the employees of a plant become "departmentalized," that is, they want to complete the work in their department only. If, in doing this, other departments are penalized or they cannot accomplish their aim, the whole plant suffers. Regardless of how cheap the work can be done in any one department, it is too high. Take a case in point. A manufacturer of electric irons has an excellent set up for producing the iron. The department where the tops are stamped does a good job inexpensively. However, in the forming process a lubricant is used which hardens up if left on the work twenty-four hours. Everything goes fine until the week end at which time the lubricant hardens up and is almost impossible to take off in the metal cleaning operation the following Monday morning. Is it the plating department's fault that production is down on Monday? This is just another reason for calling it "Blue Monday." The answer, of course, is no. The fault is with the lubricant and the department which continues to use it. If they continue to use such a product, they are "departmentalized."

On the other hand if departments work together, such happenings can be prevented. More will be said about this later. Metal cleaning begins when the first operation is performed on the metal or alloy used to manufacture the item. For this reason it will pay everyone to look into the situation at any specific plant. Following is a list of all methods used to form metals and alloys. Later a discussion of the materials used as aids in such operations will be held and, at the same time, the cleaning methods best applied to them.

There are five general divisions used in metal form-

ing. These, with their subdivisions, are given below:

- | | |
|-----------------|-----------------------|
| I. Casting | III. Wrought |
| A. Sand | A. Hammer |
| B. Die | B. Roll |
| C. Rubber | C. Spin |
| D. Wax | IV. Powder Metallurgy |
| E. Condensation | V. Electroforming |
| II. Cutting | |
| A. Tool | |
| B. Die | |
| C. Drill | |
| D. Punch | |
| E. Draw | |
| F. Saw | |
| G. Grind | |

Surface Contaminants

Almost any metal or alloy can be formed by using one or more of the above. To accomplish this, certain materials are used as aids which lessen the time required, increase the life of the tools, require less power, and give a cleaner and smoother product. The materials used can be any number of products and will be discussed individually.

In casting, the molten metal or alloy is poured into molds which can be sand, steel, bronze, rubber, wax, or combinations. Sometimes there are cores inserted into the molds so that hollow areas will be formed. The cores are sand plus some type of organic binders which are composed of linseed oil, calcium resinate, glycerol tallate, glycerol resinate, rosin, and solvents. Generally speaking, these binders will burn out when the molten metal is introduced. About the only thing which will remain from these is sand as SiO_2 . This can be cleaned off by "rattling" or other type of abrasive mechanical cleaning. The results are good, in general. Now and then it is essential to dip the castings into hydrofluoric acid which, of course, will dissolve silicates.

Die castings are produced by casting the molten metal into steel or bronze molds. There are very few

impurities encountered here. The same is true of the rubber and wax molds. Condensation methods are rarely used.

In the cutting operation, II. A through E can be treated as one. In general, a material is applied which will prevent the cohesion of the molecules. Many times sulphur in one form or another is added. Mineral oil is also a general additive. Other materials which are used are:

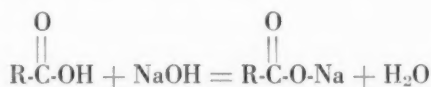
Organic: Rape seed oil, asphaltic black oil, lard oil, stearin, stearic acid, oleic acid, olive oil, glycerine, glycols, rosin oil, rosin, beeswax, carnauba wax, japan wax, carbon disulfide, carbon tetrachloride, sodium stearate, tallow, sodium alginate, petrolatum, mineral oil, paraffin oil, castor oil, camphor oil, diglycol stearate, wool fat, pyridine derivatives, chlorinated paraffins, surface active agents.

Inorganic: Graphite, calcium oxide, calcium hydroxide, zinc oxide, sulphur, white lead, zinc chromate, sodium silicate, surface active agents (phosphates, etc.)

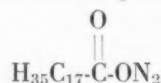
Combinations: Aluminum stearate, aluminum oleate, calcium oleate, calcium stearate, chromium oleate, lithium stearate, lithium oleate, naphthalene, sulfuric acid.

From the above, one can see the large variety of materials used in the cutting operation. On looking over the list it will be noted that a number of the organics are saponifiable, that is, will unite with sodium hydroxide to form a soluble soap. These materials will clean well. Thus, by immersing the object in a cleaner having 2-4 oz./gal. of sodium hydroxide, trisodium phosphate, sodium silicates, etc. a water soluble soap will be obtained. Not only will the product be removed but other materials which are insoluble in water will be suspended and removed from the surface at the same time. In general, it can be said that a material

with a carboxyl group, namely $\text{R}-\overset{\text{O}}{\parallel}\text{C}-\text{OH}$ will be easy to clean with an alkali cleaner as shown by the equation below:



If R is a radical of $\text{C}_{17}\text{H}_{35}$, the product resulting will be



or sodium stearate, which is soap. This, of course, is dispersible in water. It will also aid in removing other materials.

A word of caution should be noted here in regard to acid number. Esters, which are combinations of fatty acids and alcohols, have low acid numbers but many esters are excellent cleaning materials. In fact many wetting or surface active agents are esters. These not only are dispersible in water but are, in many cases, excellent dispersing agents. These, of course, aid metal cleaning materially. Most of the organic compounds used are soluble in organic solvents, such as trichlorethylene and perchlorethylene. This is not true, of course, of the alkali metal salts and sodium alginate.

The inorganics such as calcium oxide, calcium hydroxide, zinc oxide, white lead, sulphur, and zinc chro-

mate, are not soluble in aqueous solutions or organic solvents. The best way to remove these is by dispersion. Thus, if a wetting agent is present, these materials can be removed by dispersing them in aqueous solutions. At times troublesome results can occur. Take an example of a white lead addition to a drawing compound. If the temperature goes too high momentarily, which does happen, the water can be expelled and the basic lead carbonate can be reduced to lead oxide, and this can be drawn into the metal under treatment. If reducing conditions are present it is possible for the oxide to be reduced to metallic lead and, of course, all of the inherent weakness of this metal would be transferred to the metal or alloy being drawn. Such fantastic situations do develop at times.

In general, drawing compounds do not give too much trouble. However, cases are on record where metal cleaning troubles have been traced to these lubricants. These materials should be cleaned off the work as soon as possible so as to prevent any set-up which might take place over a period of time.

The remaining two, sawing and grinding, are rather easy to handle. Sawing is only used on rare occasions and very seldom is there a lubricant used in the operation. The remaining operation, grinding, in some cases uses a coolant which is water plus an inhibitor to prevent rusting. As these materials are water soluble or water dispersible, they present no hardship in the cleaning field. Now and then a film of aluminum oxide or silicon carbide may be left on the work. This is rare, however, and such a film can be removed in a dilute solution of sodium hydroxide or hydrofluoric acid.

The next, known as the wrought group forms the metal or alloy by external pressure either at room or elevated temperatures. It is possible to classify II-E, which is Drawing, under this heading, but it is felt that it could best be classified above. As a group, the first and second can be accomplished at elevated temperatures. This is especially true of (A) Hammering. This is generally known as forging and presents no undue hardship in cleaning. There are no materials added during this operation, only a mill scale is produced which can be cleaned without trouble.

The same applies to rolling. This, however, can be accomplished either cold or at elevated temperatures. No further comment need be given here. Spinning is a clean operation and is accomplished at room temperature. Now and then an organic lubricant in dilute form is used but, again, no unusual trouble is encountered here.

Powder metallurgy consists of injecting powdered metal or alloy into a die under high pressure in order to cold form the material. After the object has been cold formed it is then subjected to a fusion temperature where the molecules coadhere to form a continuous body. Thus, there are no coherent problems in cleaning this type as no foreign materials are involved that are not destroyed during the heat treating process. One thing which is important is that the inherent porosity of products so formed is not good from the point of view of finishing. The aqueous solutions are absorbed into the minute openings and later have a tendency to come out and ruin the finish.

Electroforming is a cold forming process which has

found many interesting applications in the last few years. In general, no specific cleaning problems are encountered due to the way in which the product is made. The baths themselves are chemically clean and deposit the metal in question in a very pure state. Therefore, one would not look for dirty surfaces to be produced in such a process.

Polishing and Buffing Compounds

After the object has been formed, in many cases the surface must be deburred, ground, polished, and buffed before the object is ready to be lacquered or plated. Deburring additives are of two general types, abrasive and lubricant. Sometimes there is a third type, namely a vehicle which serves to carry the abrasive to the work. Some typical materials are given below:

Abrasive	Lubricant	Vehicle
Silicon carbide	Stearic acid	Sawdust
Silicon dioxide	Carnuba wax	Leather
Steel balls	Mineral oil	Wood shavings
Artificial stone		
aluminum oxide		
silicon carbide		

The above can be carried out either in the dry or liquid state. If it is the latter, the pH can be varied from 2.5 to 11 depending upon the metal to be treated. At the same time alkali salts are often dissolved in the aqueous phase.

The cleaning angle of all these does not present any outstanding problem. Passivity in some metals or alloys may occur but this can be removed by immersing in the proper solution. In fact, the above is actually a surface removing process and, therefore, is a cleaning method. In many instances the work from this operation can be lacquered or plated without further processing, if desired. True, it is not as good as a polished job but will suffice for many applications.

After a design has been obtained, several pieces are often joined together. This can be done by riveting, knurling, soldering, etc. Cleaning problems are sometimes encountered in the latter, especially if soft solder is used. As the lead is increased, the working temperatures are lowered but the joint is harder to cover with subsequent electroplate due to the higher content of lead. In extreme cases it is essential to scratch brush the soldered joints in order to get good coverage. This is especially true if the basis metal is a copper alloy, such as brass, and it is bright dipped.

In many cases a very high polish is desired, and this can be obtained only by polishing and buffing with a wheel upon which is placed a buffing or polishing compound. In this way a bright finish can be obtained which is very pleasing to the eye. In order to produce the best finish, a wheel of the proper material must be used which is traveling at the correct speed and the correct buffing compound must be applied. The wheels can be made of wood, walrus hide, canvas, sisal, etc., but most wheels are of canvas which, of course, is cotton or cellulose. The diameter varies from perhaps 2" to 20". The important thing is not diameter or r.p.m. but linear feet per minute. These speeds vary from 6000 to 9000 feet per minute. In Table I are listed the

metal to be cut or colored, the type buffing compound, and the wheel speeds.

TABLE I
Compounds and Buffing Speeds Recommended for Various Metals

Metals	Wheel Speeds (ft./min.)	
	Cut	Color
Aluminum	6-9000	6-8000
Brass	6-9000	6-8000
Bronze	6-9000	6-8000
Chromium	3-10000	7-9000
Copper	6-9000	6-8000
Nickel Plate	6-9000	6-8000
Nickel Silver	6-9000	6-8000
Slush Metal	6,9000	6,8000
Silver	6-9000	6-8000
Cold Rolled Steel	3-10000	7-9000
Stainless Steel	3-10000	7-9000
Zinc Base Die Castings	6-9000	6-8000

Ordinarily there are at least five types of buffing compound bars used by the trade. This can be expanded to a higher number, but these will serve to illustrate the point at hand. They are:

1. Tripoli
2. Lime
3. White Polish
4. Chrome and Steel
5. Red Rouge

These bars contain tripoli, lime, silicates, aluminum oxide, silicon carbide, chromium oxide, and iron oxide as the abrasives, and stearic acid, petrolatum, tallow, glycerides, tall oil, beeswax, rosin, and complex esters as the vehicles. As an example, tripoli is suspended in stearic acid to form a simple mixture known in the trade as a tripoli bar. There are many variations to this simple mixture which aid in producing a material that gives a better and faster cut and gives better mileage. This is done by increasing the adhesion of the abrasive to the wheel, and by producing the correct lubricating value so that the metal being treated is polished and not cut away or scratched.

It has been pointed out that the buffing compound is applied to the wheel and then the metallic part is buffed or polished. This, of course, is accomplished by mechanical force. The polishing wheel rubs against the metallic part. The buffing compound acts as a cutting agent, a polishing agent, a lubricant, and prevents burning, scratching, and excessive cutting away of the metal. The whole operation is not fully understood. Some have expressed the opinion to the author that the surface of the metal actually reaches the fusion point and, under the motion of the wheel with the correct buffing compound, the metal flows out into a mirror like surface. Thus, scratches, high and low points, etc., are eliminated and an even surface remains. Stearic acid is one of the best materials for this. It seems to lubricate, carry the abrasive to the point of contact, yet prevents scratching during the contact time.

Opinions have been expressed as to the temperatures developed during this operation. In order to find out about this the author hopes to carry a number of tests in the near future. This will be reported later.

After the polished surface is produced, the manu-

facturer is now ready to lacquer or deposit metal on the surface. But, before doing this, the buffing compound and the products of buffing must be cleared away. Many times serious difficulty is encountered here. If the dirt at this point cannot be removed, *no matter how economical the operation has been it is too expensive*. Many times the plater is blamed for the situation arising but he had nothing to do with it. Let us examine the circumstances more closely. It will be noted that (assuming all dirt prior to buffing and polishing has been removed) the foreign matter present will be composed of the following:

1. The buffing compound, which is stearic acid or a substitute for the stearic acid, and the abrasive.
2. Cellulose. This comes from the polishing wheel.
3. The metal or alloy being polished.
4. Mixtures of 1, 2 and 3 and any decomposed products of 1, 2 or 3.

It will be seen that the above is a mixture of a vehicle such as stearic acid and/or petrolatum, an abrasive such as tripoli, cellulose from the wheel, the metal or alloy itself, and any decomposed products of the above. All of these are insoluble in water and only the vehicle, stearic acid and/or petrolatum, are soluble in organic solvents such as trichlorethylene or perchlorethylene. When cleaning such mixtures it is no wonder that trouble is encountered.

Degreasing is a simple process which has been in use for the last two decades. It has many interesting applications. For instance it is a nonaqueous phase; the work coming from the operation does not have to be dried. In fact, by using perchlorethylene, work can be dehydrated in seconds and, by using the proper wetting agent, a film free surface can be obtained, thus doing away with the old sawdust box and the back breaking labor which went along with it. It is felt that degreasing is a common process which is understood by all in the trade and no further comment on it will be given here.

Ultrasonic Cleaning

There has been, within the last year, a new adaptation of physics to degreasing which is very interesting. It has been recognized for some time that one of the greatest handicaps to degreasing has been the lack of agitation of the solution passing the surface of the work to be cleaned. In order to overcome this, the field of ultrasonics has been adapted to degreasing. This interesting development can also be used in the aqueous alkaline cleaners.

The commercial adaptation of ultrasonics to metal cleaning consists of converting electrical energy into a specific type of mechanical energy of high frequency vibrations. The latter can be transformed through a fluid, such as water, to the object to be cleaned. The part to be cleaned is immersed in the solution for a period of 10-60 seconds during which period the bath is vibrated from 300,000 to 1,000,000 cycles per second. The results are excellent, as the action goes into corners and deep crevices, removing dirt, oil, grease, etc.

According to Gurnham,² the operation is expensive

and, perhaps, will be limited to small parts. At least one company has a unit operating on 120 volts with an ultrasonic frequency of 430 kilocycles per second.²

There are three methods used to generate electrical energy into sonic energy. These are (1) the electromagnetic, (2) the magnetostrictive, and (3) the piezoelectric. Electromagnetic ultrasonic generators are based on the push-pull of an electromagnet operated on A.C. current. These units are not efficient at high frequency application due to the energy losses caused by eddy currents.

Magnetostrictive devices vary in size as the magnetic field varies. Iron, cobalt, and their alloys function well, but nickel and Monel are very good. These elements are limited to a frequency range of 15-100 kilocycles per second, if high efficiencies are desired.

Piezoelectric sonic generators also change in dimensions provided a high frequency electrical voltage is applied. Such a current can be supplied by an electronic oscillator. The first commercial units, called transducers, were single crystals of quartz cemented between steel plates. At present ceramic materials are being used and the best is barium titanate which can be molded, cast, or extruded into miscellaneous shapes and sizes.

Ultrasonic energy is lost easily and so must be produced close to the point of use. When transferred through a fluid, it is converted into heat by viscous damping. It is also lost by absorption at the container walls. If the pressure variations are extremely great, loss by cavitation can be large. Here the liquid is separated momentarily creating a hollow cavity and then collapses. It has been pointed out² that this property could be very beneficial in metal cleaning. Another loss of power occurs when solid particles suspended in the solution drag or absorb energy. Therefore, it is essential to filter the solution at all times to prevent a needless high loss.

According to Morris³ the first ultrasonic metal cleaning machine was demonstrated in 1952. At present these units are available in ranges from 500 watts to 25 kilowatts.

As mentioned above, barium titanate is an excellent material for making flat transducers. These are polycrystalline ceramics molded into various shapes and then fired in a furnace. This material, after firing, is composed of many small unaligned crystals. These crystals must be aligned before they will react as a transducer. This is accomplished by placing the unit into the field of a strong electromagnet and is known as polarization.

Originally the largest area was no more than two to three inches long. At the present time transducers are manufactured which are over 20 inches in length. Research into the ultrasonic generator field has shown engineers how to design barium titanate transducers which can be used at high watt density using lower frequencies in order to increase the active cleaning areas.

Removal of Surface Films

At this point it might be well to discuss in detail metal cleaning per se. It is general knowledge that, if a clean surface is not obtained before an electrodeposit

(Continued on page 65)

BARREL PLATING EQUIPMENT

By J. B. Mohler

Plating Costs

COSTS for rack plating of very small parts are often prohibitive, due to the labor required for individual handling of small pieces. As size, for a specific shape, is decreased, a point will be reached where the plating cost per piece will become greater rather than less for smaller pieces.

Costs for barrel plating of small parts can be estimated on a volume or pound basis. As the number of pieces per quart increases the cost will drop almost proportionately. This relationship will not hold, of course, for precious metals.

If enough data are available to calculate plating costs for various sizes, then the most economical method can be estimated. Hypothetical curves are shown in Fig. 1. At some point these curves will cross and define the work size below which barrel plating becomes an economic necessity. This break even size may range from $\frac{1}{2}$ inch to 3 inches, depending on plating problems for the class of work and on the type of equipment available. It is to be expected that a comparison of automatic equipment will shift the break even point.

For plating of many small parts, a rough approximation will show an immediate cost advantage for barrel plating. Bulk handling methods, floor space, and labor will all be less costly than for rack plating.

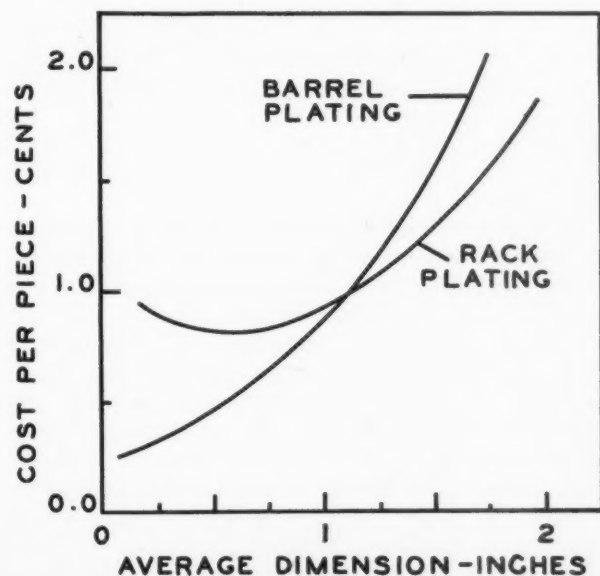


Fig. 1. Plating Costs.

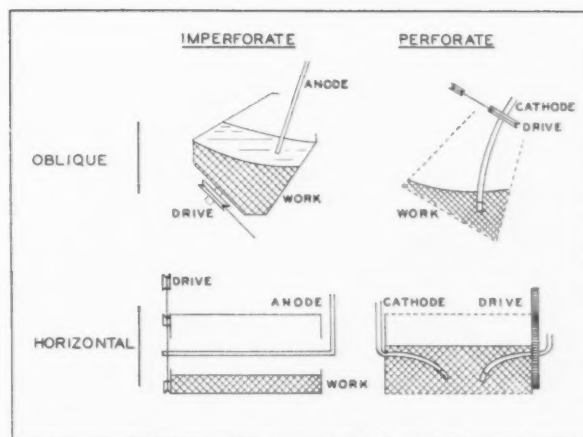


Fig. 2. Types of Barrels.

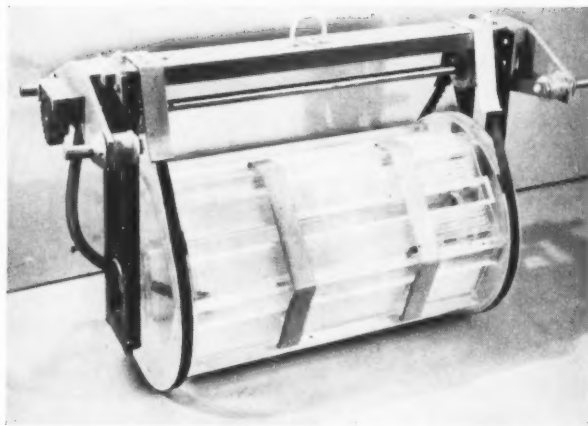
Barrel Plating Equipment

Barrels range in size from 3 in. x 4 in. up to 2 ft. x 5 ft., and are used to plate parts ranging in size from many hundreds of pieces per ounce up to five or more pounds per piece. Single small lots or tons may be plated, using multi-purpose or single-purpose equipment. Barrels may be adapted to still tanks or to specialized barrel plating lines. Accessory equipment is available for cleaning, pickling, rinsing, striking, and bright dipping.

Barrels are perforate and imperforate, both in oblique and horizontal types, as shown in Fig. 2. The anode is placed inside of the imperforate barrel and outside of the perforate barrel. Contact with the work is made by means of a dangler or contact buttons embedded in the insulating material of the barrel. Drives are by belt, chain, or gears selected to resist the corrosive environment to which they are exposed.

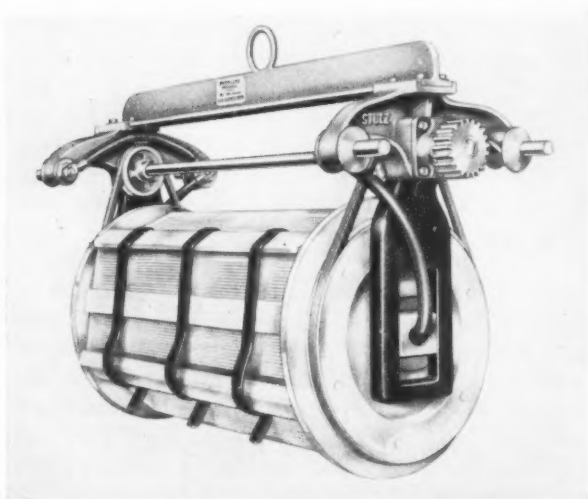
Horizontal Barrel Plating Line

A complete barrel plating line must contain equipment for bulk handling of the work through every step of the cycle. A popular type of barrel that is used as a basis for design of such a line is shown in Figs. 3, 4, 4A and 5. This type of barrel is available in hard rubber and in solid and laminated plastics. The barrel is transferred from one unit to the next by means of a hoist, and a source of power for rotating the barrel is available at each desired station. The cylinders in Figs. 3



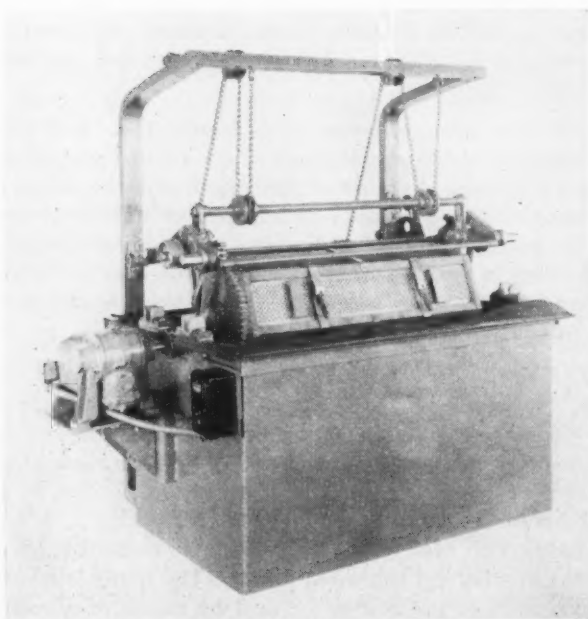
(Courtesy G. S. Equipment Co.)

Fig. 3. Horizontal Barrel with Belt Drive.



(Courtesy George A. Stutz Mfg. Co.)

Fig. 4. Horizontal Barrel with Belt Drive.

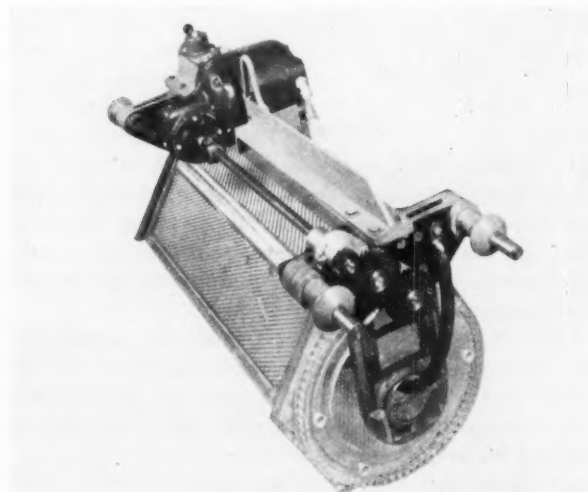


(Courtesy Charles F. L'Hommedieu & Sons Co.)

Fig. 4A Horizontal Barrel with Lifting Device.

and 4 are belt driven, while that in Fig. 5 is gear driven, and has the drive motor mounted on the frame itself, thus obviating a motor on each tank.

A sequence of typical operations is illustrated in Fig. 6. Loading, unloading and transfer equipment is available to take advantage of corrosion resistant materials throughout the line and to handle convenient bulk quantities. A large basket may be used for cleaning and pickling. A portion of this basket may then be transferred through a rinse, by means of a hopper, and loaded into a barrel. A portion of the barrel may be transferred to a hot rinse and centrifugal drier. By



(Courtesy Hardwood Line Mfg. Co.)

Fig. 5. Horizontal Barrel, Gear Driven, with Drive Motor Mounted on Frame.

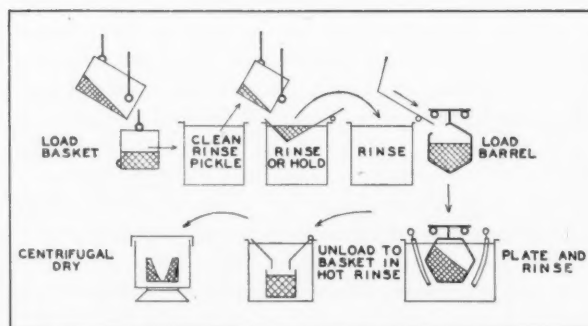


Fig. 6. Handling Sequence for Processing Operations.

proper choice of the number of barrels, hopper sizes, and rinsing stations, the line can be designed for maximum utilization.

A partial view of a multiple cleaning tank is shown in Fig. 7. An interesting feature of this particular equipment is the knife switch contact which causes a wiping action and keeps the contact clean.

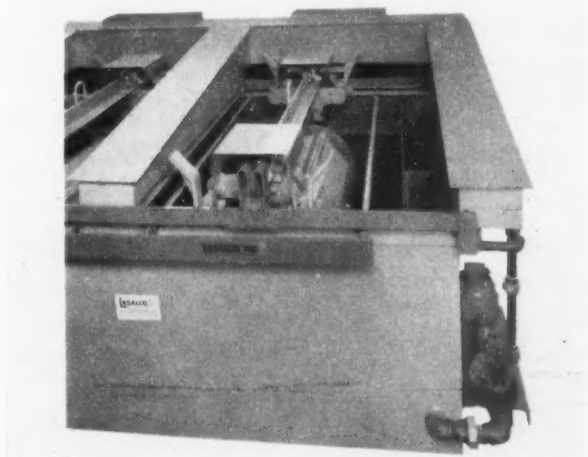
Special purpose barrels may be used in a portion of a line or they may be used for cleaning or pickling, exclusive of plating. Such equipment might be regarded as barrel finishing equipment. Tumbling of work in a barrel is often an efficient means for cleaning and pickling. The Monel cylinder of Fig. 8 is manufactured for use in a cleaning and pickling cycle where the work is tumbled in all stations.

Custom designed equipment, semi-automatic transfer devices, and multiple stations are available. The six

cylinder motor driven plating apparatus of Fig. 9 serves as the basic equipment on which a line is designed. The multiple tank is selected to obtain the desired production volume. The remainder of the equipment is then selected to service this unit.

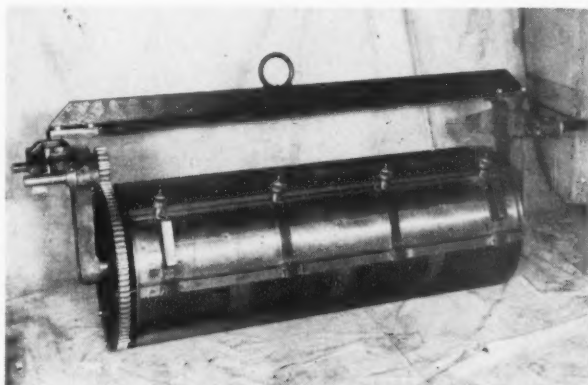
Recent Developments

A number of very small plating barrels, such as shown in Fig. 10, have appeared on the market recently. Small barrels have been used in the jewelry business for many years, but such sizes are finding increasing



(Courtesy Lasalco, Inc.)

Fig. 7. Multiple Cleaning Tank with Knife Switch Contacts.

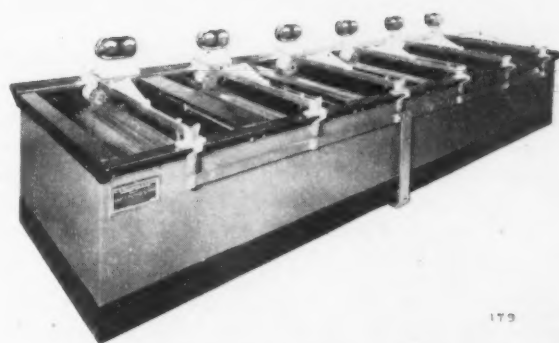


(Courtesy The Udylite Corp.)

Fig. 8. Monel Cylinder for Cleaning and Pickling.

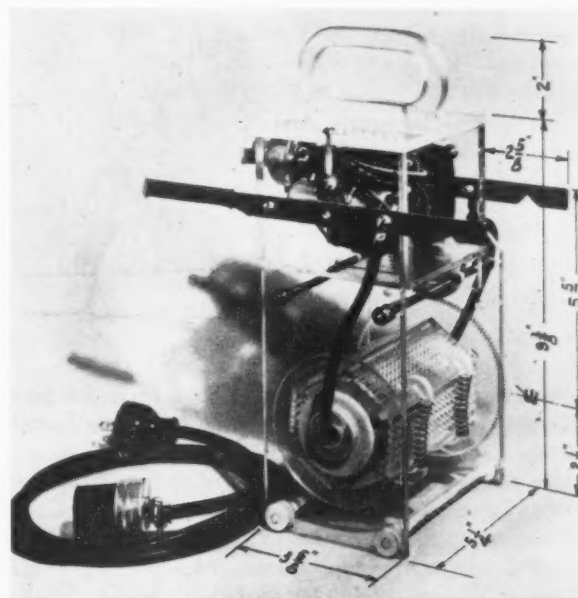
industrial usage for plating small electrical and electronic parts. Possibly another factor is simplicity of construction with the acrylic resins. In the past six or seven years Lucite and Plexiglas have become very popular for the construction of plating barrels. The acrylic resins can be fabricated from sheet and diffusion bonded so that strong, tight corrosion resistant joints are obtained. Also these materials are corrosion resistant to the majority of solutions used for plating, so that the same barrel can usually be used for complete processing.

Perhaps the Lucite barrel of Fig. 11 can be considered as a dividing line between large and small barrels. This barrel is similar to the smaller barrel, but is 6 in.



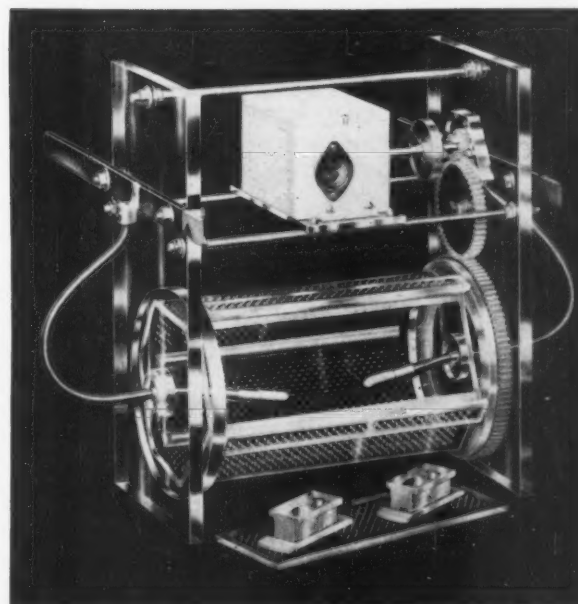
(Courtesy U. S. Galvanizing & Plating Equip. Co.)

Fig. 9. Six Cylinder Plating Installation.



(Courtesy Daniels Plating Barrel & Supply Co.)

Fig. 10. Small Acrylic Resin Plating Barrel.



(Courtesy Starline Products)

Fig. 11. Portable Plating Barrel.

x 12 in., a size often listed as a minimum for standard portable barrels.

One of the most recent developments is a double oscillating horizontal cylinder (Fig. 12), eccentrically mounted so that parts move back and forth across the cylinder in addition to the circular motion. This is said to enable flat parts, which might stick, to be plated.

Portable Barrels

Barrel sizes of 6 in. x 12 in., and 10 in. x 18 in. are manufactured as self contained portable units by a number of manufacturers. These barrels contain a motor that is carried with the barrel. Consequently, they can be rotated in all tanks and are easily adaptable to a still plating line. Such equipment is useful where it is desirable to rack plate and to barrel plate, using the same tanks.

The acrylic barrels are interesting in that one can readily see the barrel construction. The fundamental requirements are for a drive, a rotatable enclosure, work contacts, an anode contact, and a path for the current. Good tumbling of the work is necessary, and it is desirable for the solution to flow or be pumped through the barrel as efficiently as possible. The hexagonal shape of the barrel and internal ribs aid in tumbling of the work. Internal and external ribs aid the pumping action of the solution.

Automatic Barrel Plating

Oblique and horizontal barrels have been fitted to full automatic plating machines for large scale barrel plating.

The plating, loading, and unloading positions for oblique barrels are shown in the partial view of the full automatic machine in Fig. 13. This machine was designed for complete processing of small parts, including cleaning, pickling, striking, plating, bright dipping, and drying. The machine can be loaded and unloaded manually or automatically and will handle 1200 pounds of work per hour. The barrels are rotated by means of a worm and gear, and transfer from one tank to the next is accomplished by means of hump type cams. A similar type of machine is shown in Fig. 14. The cylinders are 18" diameter by 22" deep.

The drier can be seen mounted on top of the machine chassis. A motor driven steam jacket type blower forces air into the tops of the plating barrels as they complete the cycle prior to unloading. Barrels are available in Lucite, steel coated with rubber, and other plastic coatings.

Fig. 15 shows a row of barrels in the raised position on an elevator type full automatic plating machine. The barrels are driven from the motorized conveyor arms.

On this type of machine the barrels are raised and lowered in a vertical plane so that a minimum of space is required to provide for transfer. The forward travel of the machine is by chain drive and is independent of the counterweighted crank device that raises and lowers the carriers. This construction allows for regulation of dwell time and conveying of heavy loads. The barrels move forward one space for each mechanical cycle of the machine and can move either in the up or down position. Complete automatic processing of

horizontal barrels can be realized with this type of equipment.

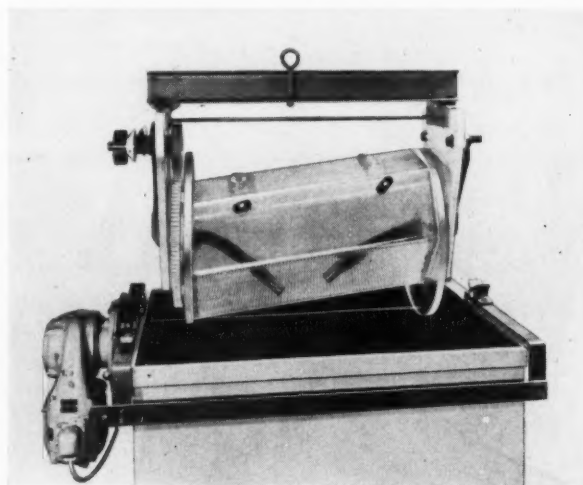
Shape and Size of Parts

Small compact parts, such as nuts and bolts, are ideal for barrel plating. Larger heavy parts may damage one another and cause appreciable wear and abrasion of the barrel as a result of the tumbling action. The solution itself acts as a cushion to retard the fall of tumbling pieces. However, where milder action is required, a rocking cradle is sometimes used as an alternative mass plating method.

Parts that nest or tangle can cause difficulties. Sharp edges may have the plating worn away rapidly while in the barrel. On the other hand, heavy plating on edges is not always desirable and such wearing action may be beneficial.

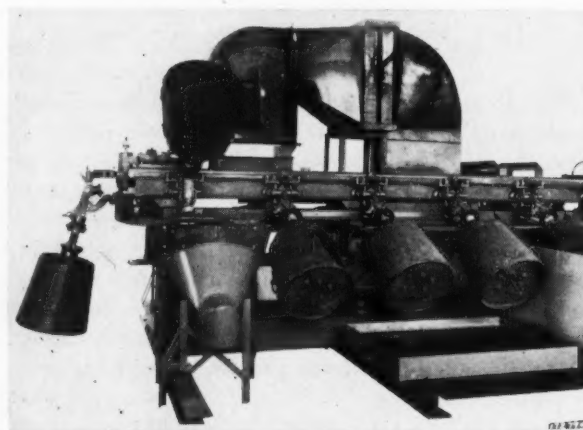
Parts may be of such a dimension that they will jam in the barrel and stop the tumbling action.

To evaluate size and weight factors it is best to plate a few loads of work and examine the parts for damage, distortion, distribution of the deposit, and uniformity of plating within the load. If the size is sufficiently large for rack plating, it is best to design a rack that can be loaded rapidly and to compare the advantages and disadvantages of both methods. Borderline cases will be in the minority, but ingenuity applied to plating rack design has solved many problems.



(Courtesy Belke Mfg. Co.)

Fig. 12. Double Oscillating Cylinder.

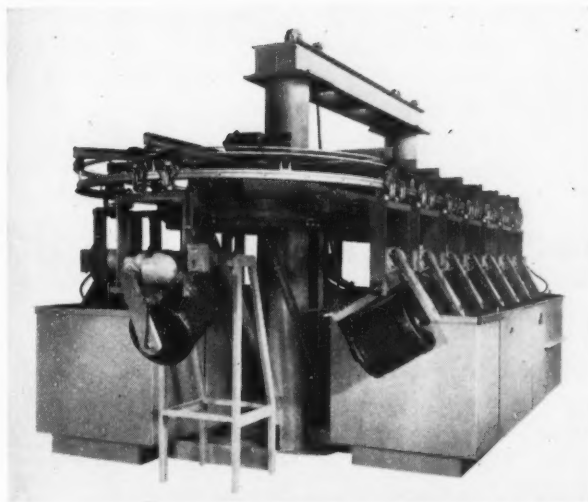


(Courtesy Frederic B. Stevens, Inc.)

Fig. 13. Full Automatic Plating Machine Employing Oblique Barrels.

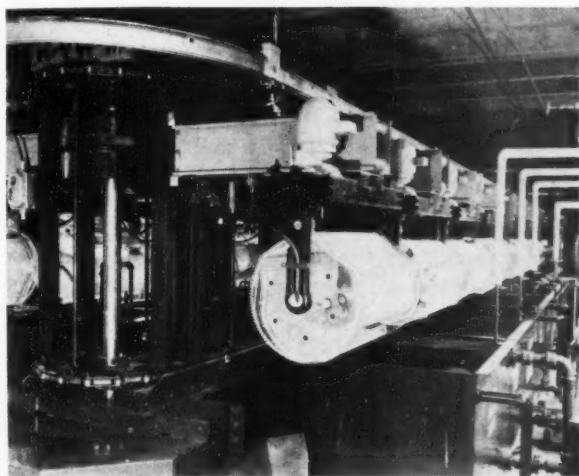
CLEANING METALS AND ALLOYS

(Continued from page 60)



(Courtesy Crown Rheostat & Supply Co.)

Fig. 14. Full Automatic Plating Machine with Individually Driven Oblique Barrels.



(Courtesy Hanson-Van Winkle-Munning Co.)

Fig. 15. Elevator Type Automatic Machine with Horizontal Barrels.

Materials Handling Equipment

Many types of less conventional equipment are available for processing of parts prior to or after plating. Hoists and various types of conveyors can be used to handle the work in storage barrels, tote pans, or by belt conveyor.

Pre-cleaning may be done with conveyorized degreasing machines or with automatic power washing machines. Such machines will handle parts in false bottomed tote boxes, by open mesh belt or by helical drive through a rotating drum. Movement through a rotating drum by means of a helix is a good general processing device. It may also be used for driers or for processing with various commonly used solutions. It has also been applied for processing through an imperforate horizontal plating barrel.

The type of equipment used to bring the parts to the plating line and to continue in process after plating will be dependent on general plant handling methods as much as on the plating equipment. A variety of standard equipment is available for mass handling methods.

is applied, a non-adherent plate will be obtained. Furthermore, if a large amount of dirt is present, no deposit will be forthcoming. For these reasons, it is essential that a chemically clean surface be obtained before plating or, if any film is present, it must not deter the deposition of a fine grained adherent deposit. From the above one would gather that the various kinds of foreign matter to be removed usually consists of any one or heterogeneous mixtures of the following: mineral oils, as represented by lubricating oils; rust preventatives, which are usually mixtures of petrolatum and wool grease, or processed petroleum derivatives; drawing compounds, which vary from straight soaps or oils to very complex materials containing spacing materials such as talc, graphite, white lead, lime soaps, or combinations; buffing compounds, containing stearic acid, tallows, resins, gums, abrasives; and, when actually found on the work, large percentages of metal particles and lint from the buffs; burnt-on carbon, usually mixed with scale, as a result of improper cleaning between heat-treating operations. In addition, there are innumerable other contaminants, such as residues from welding, brazing, and soldering, scales from heat treating, various products of corrosion, sulphide films from special organic film makers in cutting oils, abrasives from numerous grinding and tumbling operations, etc. In addition to the above types of matter to be removed, there are other types that form during the time of processing in the finishing department. Some of these are very insidious because they cannot be seen, but exert a tremendous influence on the type of deposit. Among them are soap films, adsorbed gas, passivating deposits such as chromate films, metallic smuts and oxides, organic matter from the rinse waters, and reaction products from the various cleaners and acid dips.

Generally speaking, all straight oils and greases are readily removed in chlorinated solvents, and compounds such as buffing compositions containing straight oils, fats, waxes, and inert materials, are likewise removable. However, any materials containing the above but, in addition, having components containing water, such as soaps, as in soluble oils, are not efficiently removed in chlorinated degreasing solvents. They can be removed readily, however, in emulsifiable solvents or alkaline cleaners. Once the work has been freed of the greases, oils, etc., the remaining films such as the scales, oxide coatings of lesser degree, sulphide films, products of corrosion, and other inorganic matter, are more or less easily removed in the acid pickling baths either by simple immersion, spray pickles, or electrolytic pickles. As these last operations are usually considered separately from the grease removal operations, we shall not comment further about them.

Much of the above can be cleaned with an alkali cleaner which is capable of emulsifying and saponifying the dirt. For this reason, an alkaline cleaning is more generally used than any other in metal finishing. This being true, the bath will be taken up and discussed in some detail.

(To be continued)

Surface Treatment and Finishing of Light Metals

Part XI. Properties of Anodic Coatings

By S. Wernick, Ph.D., M.Sc., F.R.I.C., F.I.M. and R. Pinner, B.Sc.

This is the second half of Part XI of this series by Dr. Wernick and Mr. Pinner. The first half appeared in the September issue.—Ed.

Corrosion Resistance

The methods for determining the corrosion resistance of aluminum have already been discussed. In general, there is little difference between the problems involved in dealing with corrosion resistance of anodized work as distinct from untreated or chemically-oxidized work, though some special problems may arise and modification of the methods may be necessary.

As before, it is possible to distinguish between exposure tests and the various accelerated laboratory tests, the former being useful in any fundamental investigation of the behaviour of various aluminum alloys with various treatments under specific conditions of exposure, the latter finding their use in routine testing where a certain standard of corrosion resistance has been set. These accelerated tests have often been used also for comparison between various protective

coatings or alloy conditions but it must be emphasized that results based on such tests may often be misleading and may reflect the resistance of the metal or coating to a certain type of exposure. Salt spray tests, for example, are most useful when applied to work designed for marine exposure. Exposure tests especially, when applied to anodized specimens, have the obvious disadvantage of extensive testing periods (sometimes up to several years) and this has obviously limited their use appreciably; results obtained by such means are, however, correspondingly valuable.

EFFECT OF AFTER-TREATMENT

In one of these tests, J. D. Edwards²⁶ made a comparison of the performance of anodic coatings with different after-treatments, and related these results with salt-spray tests on identical specimens (see Table IV). Two alloys were used for the experiments, 52S and 14S, and specimens were exposed in four different situations for periods varying from 36 to 45 months. His results in the exposure tests were based on visual evidence of local film breakdown followed by accumulation of corrosion products and general roughening. The

TABLE IV. Corrosion Resistance of Sealed Coatings

Panel	Alloy	PROTECTIVE TREATMENT				SALT SPRAY			NATURAL EXPOSURE							
		Electro-lyte	Sealing	Anodizing time (min.)	Coating thickness (in.)	Hours to First attack			Relative attack on panels							
						1	2	3	A		B		C		D	
									Front	Back	Front	Back	Front	Back	Front	Back
2	52S	H ₂ SO ₄	hot water	20	0.00028	*	†	‡	6	2	6	3	5	4	6	3
3	"	"	"	30	0.00035	*	†	‡	3	2	4	2	4	2	5	2
4	"	"	dichromate	10	0.00012	*	1,100	‡	7	5	8	7	7	5	7	7
5	"	"	"	20	0.00029	*	†	‡	3	2	7	3	6	3	4	3
6	"	"	"	30	0.00035	*	†	‡	1	1	3	1	2	1	3	1
7	14S-T	"	"	30	0.00041	*	†	‡	5	6	2	5	2	7	2	6
8	"	CrO ₃	None	30	0.00005	600	200	200	8	8	5	8	8	8	8	8
9	"	H ₂ SO ₄	hot water	30	0.00033	600	700	700	2	7	2	6	2	6	1	5

*No attack after 6 months exposure.
†No attack after 2,100 hours exposure (approximately 3 months).
‡No attack after 700 hours exposure.

A New Kensington exposure time 42 months.
B Philadelphia exposure time 42 months.
C New York exposure time 36 months.
D Chicago exposure time 45 months.

panels in each series in a particular location were given a rating of 1 to 8 in decreasing order of merit.

The order of merit in withstanding corrosion of the outdoor exposure specimens was, therefore, Panels 6, 3, 5, 9, 2 and 7, 4, 8, and the results indicate that results of exposure tests and salt spray are mostly similar, though salt-spray tests are only an approximate guide in the case of the more resistant coatings. In a later experiment, Edwards found that certain anomalies between the outdoor and salt-spray exposed results did not occur in marine exposure (e.g., specimen No. 9). Dichromate sealing was rather more effective than hot-water sealing though no details are given concerning the exact conditions of sealing. The thickness of the coating seemed to have more influence on the resistance to weather exposure than to salt spray.

In terms of salt-spray hours, anodized aluminum is frequently specified to stand up to 250 hours or longer. According to Maucher and Gleason,²⁷ sulphuric acid films stand up to 12 months, while chemical coatings reach 250 hours salt spray only under the best conditions of alloy and treatment.

Table V gives results obtained on a number of untreated and anodized aluminum alloys obtained in experiments carried out at the British Aluminium Co. Ltd.²⁰ In these tests, some alloys were anodized in chromic acid and some in sodium bisulphate solution and exposed to industrial atmospheres and also to intermittent salt-spray. The figures given show the number of years required to reach a certain standard of deterioration. The assessment of appearance was made by comparison with a reference standard representing the maximum deterioration that can be tolerated. For pitting, a method devised by Champion²⁸ was used in which the total number of pits, their average depth and the number of pits in which the depth exceeds this average, are taken into account. The result gives an estimate of the time which might be expected to elapse before perforation extends through a sheet 0.036 in. in thickness. The columns giving mechanical properties show the time required for the loss in properties to reach 10% in ultimate tensile strength or 30% in elongation, whichever occurs first. It is noteworthy that anodizing improved the properties of all

the alloys tested with the exception of a duralumin-type alloy in industrial exposure, and here details are lacking about the type of treatment given.

A table of results of corrosion resistance in terms of fatigue strength after salt spray has been given earlier as have results with salt solution on coatings given various sealing treatments.

The corrosion resistance of a film increases with increase in thickness of the coating, i.e., with the treatment time up to the limiting thickness, the current density and the use of a.c. as well as with decrease in anodizing temperature, decrease in acid concentration, and increasing homogeneity of the alloy structure. In common with the specific abrasion resistance, the corrosion resistance may, however, reach a maximum with increasing film thickness after which it decreases.

EFFECT OF SURFACE SMOOTHNESS

The protection of the anodic coating may also depend upon the smoothness of the surface. Thus Shreider, working with surfaces which were polished, ground and sandblasted, found that the corrosion resistance as well as the loss in weight during anodizing increased with the roughness; the difference in initial roughness of the surface is given as:

Type of Finish	Roughness Average height of asperities, μ
Polished	0.28
Ground	2.4
Sandblasted	5.6

On polished samples, Schreider's experiments showed that chromic acid anodizing increased the roughness by 0.025 to 0.15 μ and treatment in sulphuric or oxalic acid by 0.15 to 0.9 μ . These results are, of course, a function of the coating thickness and porosity. Pronounced differences in the corrosion resistance are due to (1) the greater surface area of the rough surface, and hence a smaller average thickness of coating applied by a current density based on the 'apparent' surface area, and (2) the smaller minimum thickness of the deposit, i.e., distance from the surface to the top of the asperities on rough surfaces due to filling-in of depressions in the surface. These results illustrate the need for smooth polished surfaces for maximum corrosion resistance and, incidentally, the

TABLE V. Protection Against Corrosive Attack Afforded by Anodizing

Corrosive Condition	Metal	Time Required for Appreciable Effects, years					
		Deterioration in Appearance		Pitting		Loss in Mechanical Properties	
		Plain	Anodized	Plain	Anodized	Plain	Anodized
Industrial atmosphere	Al 99.5%	2½	5	> 7	> 7	2¾	6½
	Al-1¼% Mn	2	4	7	7	3	5
	Al-2% Mg-1% Mn	2½	6	> 7	> 7	3	5
	Al-1% Mg-1% Si	2	6	6	6	2½	5
	Duralumin-type	1	1	6	2½	< ½	< ½
Intermittent salt spray	Al 99.5%	< 1	9	5	> 11*	5*	> 11*
	Al-1¼% Mn	2	10*	> 11	> 11*	> 11*	8*
	Al-2% Mg-1% Mn	2	8	4	11*	2*	5
	Al-1% Mg-1% Si	< ¼	5	2	5	½	4
	Duralumin-type	< ¼	< 1	< ¼	< 1	¼	< 1

*Signifies no appreciable change during the last 6 years.

TABLE VI. Corrosion Behavior of Oxide Coatings obtained by Different Methods on Pure Aluminum, in N/20 Hydrochloric Acid at Room Temperature

Method of forming oxide coating*	Sealing†	Thickness (μ)	Time after which attack on Basis Metal began (days)
Natural oxide coating (degreased bright rolled Al)	—	0.02	1/2
M.B.V. coating	—	2.5	1/2-1
Anodic coating, boric acid barrier-coating, 200v.	Water glass	3.0	2-3
	—	0.37	4
As above, 500v.	Water glass	0.39	4-5
	—	0.67	9
Anodic coating, sulphuric acid	Water glass	0.70	9-10
	—	3.3	1
As above, plus 200 v. barrier type coating	Dist. water	—	—
	30 minutes	8.8	5
	Water glass	9.2	15
	—	11.4	21
Bohmite coating formed in boiling distilled water, 1 1/2 hrs.	Water glass	9.6	20
	—	0.30	3-4
As above, plus 200 v. barrier coating	Water glass	0.43	8-9
	—	0.40	12
Bohmite coating formed in 20 hrs. boiling	Water glass	0.45	13
	—	0.7	30
As above, plus 200 v. barrier coating	Water glass	0.92	32
	—	0.84	34
Bohmite coating formed in 1 hr. steam, 150°C.	Water glass	0.85	33
	—	0.3	15
As above, plus 200 v. barrier coating	Water glass	0.32	15
	—	0.41	18
	Water glass	0.42	18

*Barrier-type coatings are obtained in 10% boric acid with 0.1% borox, 80-100°C., 35 minutes, 200 ma./sq. dm.

†Water glass sealing is carried out for 30 minutes in a boiling 2% solution.

need for a standard finish prior to anodizing before testing the corrosion resistance of different finishes and alloys.

EFFECT OF ANODIZING PROCESS

The difficulty in basing reliable estimates on the corrosion resistance is shown by the results obtained by Willstrop and Sutton²⁹ (see Table VI). These authors compared coatings produced on duralumin in 3% chromic acid at 40°C. using the Bengough-Stuart voltage cycle with those produced in 2% oxalic acid using d.c. at 16° to 20°C. with subsequent sealing in steam. All the samples were varnished with two coatings of D.T.D. 62. Two controls were used which were unvarnished. All the specimens except the controls were exposed to sea water in such a way that they were covered only at high tides, for 19 1/2 months.

In the steam sealing used in this process, the oxalic acid coatings absorbed 0.53 gm. per sq. ft. H₂O in a coating weighing 6.9 gm. per sq. ft. originally; 73% of this water remained after heating at 170°C. for four hours.

These authors found that the sealed oxalic acid coatings had a better corrosion resistance than the chromic acid coatings, and the optimum conditions were found to be d.c. oxalic acid at 15 amp./sq. ft. They also found that chromic acid coatings were superior to sulphuric acid films. This is against the general evidence, though they may have used unsealed films, no details of procedure being given in this case.

Another method used for the determination of the protection given by anodic coatings is described by Röhrig and Lux.³⁰ In this method, parallel drops of a solution containing 3% K₂Cr₂O₇ and 25 ml. HCl (d. 1.16) in 74 ml. H₂O, are placed in contact with the surface and the time is measured till the drops turn green. Normal coatings take at least eight minutes, though values up to 13 to 14 are obtained without difficulty on sulphuric acid coatings.

Other methods depend on rotation of the sample in salt solutions and subsequent loss in weight per unit area per day.³¹

Table VI is from Altenpohl³⁹ who reported on the corrosion resistance of different coatings on aluminum as measured by the time taken for attack to begin in dilute hydrochloric acid. Although care is needed in drawing too many conclusions about atmospheric corrosion resistance from this test, the results are nevertheless interesting in that they give a comparison of the behavior of widely different types of coatings and show, in particular, the good results that may be obtained by increasing the barrier thickness of the conventional sulphuric acid coating by subsequent anodizing in a boric acid electrolyte.

Mechanical Properties

The tensile strength of aluminum is normally not greatly affected by anodizing unless the material is thin, when the brittleness of the coating may cause some decrease in the tensile strength. On the other

TABLE VII
Corrosion Tests on Various Anodic Coatings³²

Anodic Treatment	Durability under Salt Spray
None	General whitening and deep attack in one day at many points
d.c. CrO ₃ (Bengough-Stuart)	A few white corrosion spots in 100 days
a.c. Oxalic acid	A few white corrosion spots in 10 days. At end of 100 days, a number of points of attack developed but mainly at edges, corners, holes and coating blemishes.
d.c. Oxalic acid	A few small corrosion patches evident in five days, no further deterioration in 100 days
d.c. H ₂ SO ₄	Tiny white corrosion spots during first few days. Marked attack at corners and edges in 10 days. Generally rather poor in 20 days

hand, somewhat contradictory results have been obtained in investigations on the fatigue properties of anodized aluminum alloys. Oxalic acid anodizing caused a decrease in the endurance limit of duralumin according to Igarashi and Fakai³³ though Mauksch³⁴ found no change after either oxalic or sulphuric acid anodizing of either aluminum or aluminum-copper alloys. In sulphuric acid anodizing, Müller³⁵ found a decrease in endurance limit of 4-20% on aluminum-magnesium and aluminum-copper-magnesium alloys while Gerard and Sutton³⁶ obtained a 20% improvement on duralumin at 50 million cycles. More recently, Stickley and Howell³⁷ found that the fatigue properties on duralumin-type alloys and D.T.D. 687 were improved by applying a thin anodic coating. In the case of thicker coatings, the effect depended on the loading. When the specimen was highly stressed, anodizing was usually detrimental to the fatigue properties.

In some applications where hard anodizing is regarded as an alternative to hard chromium plating, in which appreciable drop in endurance limit may be experienced,³⁸ it appears that the anodizing process will generally give rather better results.

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Finishing Pointers

Bond and Adhesion

IF one metal is deposited on another under the right conditions the two metals will be bonded. The metals will be held together with sufficient strength that an attempt to separate them will result in fracturing the weaker of the two metals rather than separation at the bond line. Therefore, one cannot even measure the bond strength. It has been found that this is true for many different cases.

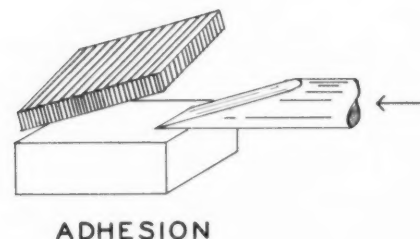
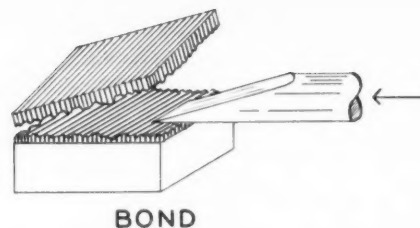
If this conception of bond is accepted, then metals will either be bonded or they will not be bonded. From the practical standpoint it is convenient to know this for testing purposes. If the actual bond strength cannot be measured, then a qualitative bond test, such as the chisel test, is just as good as a more elaborate quantitative one, such as the Ollard test.

It is not difficult to bond an electrodeposit to a basis metal. Experience has shown that, by proper cleaning and etching, the deposit can be consistently bonded. For many applications it is essential to obtain bond. For engineering purposes, such as heavy metal layers to be used for bearing surfaces, or for heavy layers that will be subjected to stress, it is essential that the coating be tightly held.

It is desirable for a permanent coating to be bonded in every case, but it is not always economical. Very thin coatings do not have to be bonded. Thin coatings used for protection from corrosion, such as tin or zinc 0.1 mil or less in thickness, are in this class. It is more economical to deposit such coatings on electrolytically cleaned steel than to insert a pickling step that would be required in order to obtain a bond.

For every application where a permanent deposit is desired it is essential that the coating adhere to the basis metal. For thin deposits the metal may adhere satisfactorily without being bonded. Adhesion strength then is something less than a bond, but something more than mere contact.

There are a great many applications for plating where it is not known whether or not the plated layer



is bonded or merely adherent. Etching or pickling that will promote bond is frequently avoided or kept to a minimum for decorative plating. This is done to avoid any loss of finish or a polished surface. An acid dip may promote bonding without loss of finish. On the other hand, such a step may only improve adhesion. In any case it is obvious that adhesion is often satisfactory.

Thin decorative deposits can often be tested by burnishing, scraping, bending, and scratching tests. If such rough treatment will not loosen the coating it will be satisfactory. If it is desired to test the plating cycle for bond then it will be necessary to deposit a coating of sufficient thickness that considerable force must be applied in attempting to remove it.

For heavier layers it is more essential for the coating to be bonded. Hard metals and highly stressed metals, such as bright nickel, require very good adhesion and, for thicknesses of 1.0 mil or more, a bond is desirable. Thinner deposits which will be subjected to heat, pressure, and rubbing, such as electric contacts, should also be bonded.

For thin soft deposits, adhesion will be satisfactory providing the deposit is sufficiently adherent that it will not peel or blister. If there is any tendency for the coating to come loose in service or, if it can be peeled with relative ease, then greater adhesion is required. Good cleaning practice will often make the difference between an adherent and a non-adherent coating. A little grease on the surface, or loose metallic films formed by immersion plating, can cause poor adhesion.

Bond tests on heavy layers are useful to establish the necessary cleaning and etching steps required to obtain a bonded deposit. If such a cycle can be established on an economic basis then it is a good cycle to use. However, if such a cycle adds expense and the application does not call for a heavy deposit, then it is better to test the thin deposit directly by less severe means, such as burnishing, scraping, bending, or scratching.



Electroplaters

18. Electrolytes

By L. Serota

PASSAGE of electric current through electrolytes, such as solution of strong acids, bases and many salts, is due to the migration (movement) of ions in the solution as the result of an impressed electromotive force or voltage. Positive ions (cations), as previously stated, move toward the cathode, and negative ions (anions) migrate toward the anode. That the process of electrolysis entails a transfer of matter is evident by the deposition (plating out) of metal, the escape of a gas, the corrosion of the anode, or changes in concentration at the electrode. With metals (or most alloys, carbon, and some solid salts), however, current is conveyed by the electrons. The nuclei of the atoms in metals, accordingly, remain stationary so that the transfer of matter does not occur as it does with electrolyses.

Current flow through electrolytes will depend upon the applied emf and the resistance of the solution, which may be expressed in terms of its resistivity. The unit of resistivity for a material is the resistance offered by a cube of the substance, one centimeter on each side, measured in ohms. Such values are given as ohm per cubic centimeter (ohm/cm.³). This property is also defined as conductivity, which

is the reciprocal or inverse, $\frac{1}{R}$, of resistivity. Resistance (or its reciprocal, conductance) to the passage of elec-

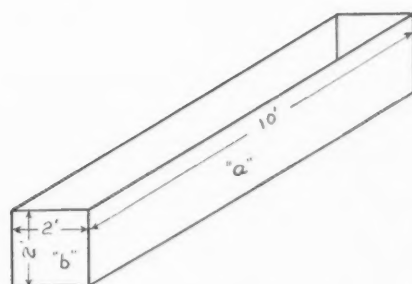


Fig. 81

tricity will vary with the size or shape of the unit, such as the solution in a plating tank; whereas resistivity (conductivity) is the property of the material. For example, the conductivity of a copper sulfate solution is the same whether it is in a gallon crock or in a 1,000 gallon tank, whereas the conductance will be quite different in each case because of the difference in dimensions. If a rubber lined tank, Fig. 81, containing electrodes covering side "a," is filled with a copper sulfate solution as the conductor, current will flow from one side to the other (designated as conductor "a"). If the electrodes are placed instead at each end, current will flow from one end of the tank to the other end (conductor "b"). The ratio of conductance

between the sides and ends can be computed as follows:

$$\begin{aligned} \text{("a")} \text{ area of sides} &= 2' \times 10' = \\ &20 \text{ sq. ft., 2 feet apart} \\ \text{("b")} \text{ area of ends} &= 2' \times 2' = \\ &4 \text{ sq. ft., 10 feet apart} \end{aligned}$$

The resistance of a solution increases as the length of the conductor is increased and its area decreased. The conductance will of course decrease in the same ratio. Hence

$$\begin{aligned} \frac{\text{conductance a (between sides)}}{\text{conductance b (between ends)}} &= \\ \frac{20 \times 10}{4 \times 2} &= 25 \end{aligned}$$

The conductance between the sides with the greater area and shorter distance is 25 times as great as that between the ends with smaller area and greater distance. Expressed differently, only one twenty-fifth of the voltage necessary to drive a given current from end to end, in this example, would be required to carry the same current from side to side. The conductivity, however, in either case is the same because it is the same solution with the same conditions.

Changes in Conductivity

Conductivity can be varied by changes in the chemical composition of the solution, changes in the concentration of the ingredients, or changes in temperature.

Changes in composition result from differences in the mobility (migration) of ions moving toward the electrodes during the passage of current through a solution. In a copper sulfate bath, during electrolysis, the hydrogen ion migrates toward the cathode at a faster rate than the copper ion. The concentration of the copper ions in the vicinity of the cathode (cathode film) would, therefore, be re-

TABLE 1. THE EFFECT OF INCREASING CONCENTRATIONS OF ADDED INGREDIENTS ON THE RESISTIVITY OF A CYANIDE SILVER PLATING SOLUTION

Effect of Potassium Carbonate			Effect of Free Sodium Cyanide			Effect of Potassium Nitrate		
Concentration		Resistivity, ohm/cm. ³	Concentration		Resistivity, ohm/cm. ³	Concentration		Resistivity, ohm/cm. ³
oz/gal	g/l		oz/gal	g/l		oz/gal	g/l	
1.9	13.9	9.6	1.0	7.5	14			17.5
10	75	6.2	4	30	11	10	75	9
17.4	130	5.0	6	45	9	16.1	120	6.6

duced were it not for replacement by mechanical agitation and diffusion. Similarly, in a Watts nickel bath a relatively small number of nickel ions are electrically transported to the cathode, so that the cathode film would become low in nickel ion concentration if diffusion and agitation did not remedy this condition. Without this effect (diffusion, agitation), before very long only hydrogen and poor nickel deposits would be obtained at the cathode. If this solution is not properly buffered the escape of hydrogen will cause a decrease in the hydrogen ion concentration and an increase in the hydroxyl ion concentration. Under such conditions nickel hydroxide or a basic salt may be precipitated.

An increase in the conductivity of a solution may be attained by the addition of other salts to a solution. Such addition tends to provide more ions for carrying the current. An example of such effect is reported by Promisel in MODERN ELECTROPLATING. A decrease in the resistivity of a silver cyanide plating solution is shown by increasing the concentrations of added ingredients such as potassium carbonate, free sodium cyanide and potassium nitrate (Table 1). The decrease in resistivity, it will be noted, is appreciable upon the first addition of potassium carbonate, but the reduction is less pronounced upon the addition of the second portion. The same effect is observed for the other two salts. A limiting value is therefore indicated for the decrease in resistivity. Silver cyanide baths do not show a resistivity value less than about 5 ohms/cm³ at room temperature.

An increase in the amount of sulfuric acid, from a concentration of 0.67 oz./gal. to 7.2 oz./gal., in an acid copper sulfate bath will result in a decrease in resistivity (or increase in conductivity) at 77°F., from 22.4 to 4.9 ohms/cm.³. The resistivity of the Watts nickel bath, about 11 ohms/cm.³, will show a decrease at greater concentration.

Electrolytic solutions will show an increase in conductivity with an increase in temperature, a factor attributed principally to the greater mobility of the ions (diffusion). This change or increase in conductivity will be about one per cent for each degree (Fahrenheit) rise in temperature.

Faraday's Laws

In electroplating operations, the quantity of electricity flowing through

a solution is of importance. The amount of nickel deposited on the cathode in a nickel plating solution or the corrosion (amount dissolved) of a nickel anode will be determined by this factor. The relationship between the weight of the metal deposited or dissolved and the given current for a definite time can be determined quite accurately. This fundamental rule derived by Michael Faraday in 1834 is referred to as Faraday's Laws of Electrolysis.

1. The quantity of substance (element or radical) liberated at the cathode or anode during electrolysis is proportional to the quantity of electricity that has passed through the solution.

2. The quantities of substances liberated by the same amount of electricity are proportional to their equivalent weights. (Chemical equivalent or equivalent weight of an element, it will be recalled, represents the atomic weight divided by the valence.)

An ampere flowing for one second (a coulomb) through a silver solution will deposit 0.001118 gram of silver. The number of grams of metal deposited by this unit of electricity, a coulomb, is termed the electrochemical equivalent. If the time is doubled, one ampere flowing for two seconds (2 coulombs), then twice the quantity, 0.001136 gram of silver, will be deposited. If ten amperes flow for one second (10 coulombs) then ten times the weight of silver, 0.01118 gram, will be deposited.

The Faraday

Deposition of the (gram) equivalent weight of silver, 107.88 grams, would require $\frac{107.88}{0.001118} = 96,500$ coulombs.

This quantity of electricity, called the Faraday, must be passed through the solution to liberate (or deposit) one equivalent weight of any substance at either electrode. Under ideal conditions the same quantity of electricity that will deposit 107.88 grams of silver will deposit or liberate equivalent weights such as 1 gram of hydrogen, 56.2

$\left(\frac{112.4}{2}\right)$ grams of cadmium, 29.3

$\left(\frac{58.64}{2}\right)$ grams of nickel, 8 $\left(\frac{16}{2}\right)$

grams of oxygen, 32.7 $\left(\frac{65.38}{2}\right)$

grams of zinc, 31.8 $\left(\frac{63.57}{2}\right)$ grams

of copper from a copper sulfate bath

(Cu⁺⁺), and 63.57 $\left(\frac{63.57}{1}\right)$ grams

of copper from a copper cyanide bath (Cu⁺). The weight of the metal deposited may be expressed by the following equation:

$$\begin{aligned} \text{Weight of metal deposited} &= \frac{\text{cur.} \times \text{time (sec.)} \times \text{atomic wt. (g.)}}{96,500 \times \text{valence}} \\ &= \frac{I \times t \times A}{96,500 \times V} \end{aligned}$$

For example: a current of 100 amperes flows for 30 minutes through a silver cyanide bath with a 5 sq. ft. cathode area, corresponding to a current

density of $\frac{100}{5}$ or 20 ampere per sq. ft.

(20 asf.). Assuming 100% conversion, the weight of the deposited silver will be determined as follows: 30 minutes = 60 × 30 or 1800 seconds. By substitution,

$$\begin{aligned} W &= \frac{100 \times (60 \times 30) \times 107.88}{96,500 \times 1} \\ &= \frac{100 \times 1800 \times 107.88}{96,500} \\ &= 201.2 \text{ grams of silver.} \end{aligned}$$

A more convenient form for such calculations may be used by substituting for the faraday, ampere-hours instead of coulombs (ampere-seconds). Since 1 hour is equal to 60 × 60 or 3600 seconds, one faraday would be represented by the value $\frac{96,500}{3600} = 26.8$

ampere-hours. With time in the equation now expressed as hours, the 30 minutes in the problem would be represented as $\frac{30}{60}$ or 0.5 hour. Substituting

in the equation $\frac{100 \times 0.5 \times 107.88}{26.8 \times 1}$

201.2 grams silver.

(To be continued)

SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL
ELECTROPLATING CLEANING PICKLING TESTING



METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Silver in Acid Copper Baths

Question: We are using an acid copper sulfate solution, without addition agents, to plate on silvered plastics. After about two months of operation, the copper deposits become dark and brittle. We are certain that this is due to both organics from the plastics and also silver from the conducting film. We can, of course, remove the organics with activated carbon, but the silver presents a problem.

Can you tell us how to remove the silver from the copper solution so that we can continue to use the tank? We must be careful that precipitants used do not interfere with subsequent plating.

H. N.

Answer: Ordinarily, the traces of silver which enter the bath are precipitated by the chlorides introduced in the water supply. Unless deionized water is being used for the purpose, the presence of chloride should not be ignored, since the effect would be the same as that of silver, namely a dark, brittle deposit.

Silver, in amount sufficient to cause trouble, should show up on the anodes, when the tank has been idle over the week-end, as a light pink coloration instead of the deep copper color. After carbon treatment to remove organics, silver if present can be removed by addition of very small amounts of hydrochloric acid, which will precipitate silver chloride. Before this, however, a small amount of dilute silver nitrate should be added to the plating bath. If the trouble is high chloride rather than silver contamination, a precipitate will form.

Chlorides can be removed by precipitation with silver sulfate. However,

it is necessary to recover the precipitate for refining, otherwise the treatment is too expensive.

Removing Rhodium Deposits

Question: Your book, METAL FINISHING, has been a great help to us for a number of years. However, I haven't found anything that would help us to strip off rhodium plating.

We have a tray that is plated rhodium on nickel silver. This tray is to be plated silver after the rhodium has been removed. Would you be so kind as to let us know this process.

O. C.

Answer: There is no chemical method for removing rhodium. Since practically all rhodium deposits are applied over nickel plate, the stripping methods heretofore suggested are based on dissolving out the nickel undercoat through the pores in the rhodium deposit, so that the latter has no anchor. In your particular case, the most effective procedure probably would be to remove the deposit on the wheel.

Bright Acid Copper

Question: On page 70 of the January issue under abstracts on bright plating from the acid copper bath by Dr. Reuss, he mentions the "Cupat" process. I would appreciate it very much if you could send me information about the process as listed in this topic.

E. S.

Answer: The "Cupat" bright acid copper plating process is offered by Riedel & Co., Bielefeld, Germany.

Large Chromium Tank Construction

Question: Recently, we have suc-

ceeded in obtaining a contract covering big-sized materials to be plated. In order to carry out such work, we are required to install a larger plating tank in our factory. Under these circumstances, we have decided to have a chromium plating tank of 13 ft. x 20 ft., liquid depth 13 ft. and capacity 25,000 gal. in our factory. But, to our regret, we have never heard of such a large plating tank in Japan. So, if you have reference literature or data covering tank materials and other data about tank equipment, please be kind enough to give us your information at your earliest convenience. This tank is planned to be put into the ground for 11 feet, leaving only 2 feet above the surface of the ground.

Y. H.

Answer: For a tank of this size, we would suggest a reinforced concrete shell, lined with acid-proof brick buttered with an appropriate chromic-acid resistant cement. An impervious interliner should be placed between the acid brick and the concrete. Vinyl materials, etc. may be employed for this purpose.

Vacuum Metallizing

Question: We have heard a lot about vacuum coating or forming and wish to know if this process would be economical to process wood arrow shafts. Is this an actual metal that is sprayed on to the object such as copper, nickel, etc., or is it one type metal that is sprayed on and then colored with lacquer, or is it simply a lacquer, or a plastic.

I have noted a toy saxophone that has a beautiful silver finish; the body of this toy is made of plastic and the finish is durable, bright and has excellent sales appeal. Would you please advise on the above, and supply a few addresses of firms that do this type work commercially.

R. M.

Answer: The vacuum coating process consists of applying a base coat of high gloss lacquer, after which the

articles receive a very thin deposit of aluminum in the vacuum chamber. The parts are then coated with a protective lacquer which may be colored with suitable dyes.

We do not know whether the process will be sufficiently economical to satisfy your requirements. That is something you must decide for yourself. However, if you can obtain a copy of the Manhattan classified telephone directory, you will find therein a number of firms who offer the coating service.

Hydrogen Embrittlement Relieving

Question: Would you please inform me as to the proper way of cooling springs after baking to relieve hydrogen embrittlement? Can the springs

be dipped in cold water, or should they be cooled at room temperature?

P. H.

Answer: Since the baking temperature employed for relief of hydrogen embrittlement is too low to affect the temper of spring steel, the parts need not be quenched but can be allowed to air dry. We would not advise a cold water dip because of consequent rusting if the parts are not thoroughly dried.

Rusting of Replated Steel

Question: I am rechroming auto bumpers. I put 20 minutes copper and buff them 20 minutes bright nickel and about 30 seconds chromium with approximately $4\frac{1}{2}$ to 6 volts. I am having trouble with rust, especially

on rear bumpers. Could you give me a cure for this?

R. E. B.

Answer: Rusting of replated bumpers is due to pinholes in the steel, resulting from corrosion of the original bumper. When replating, it is necessary to apply a very heavy copper, so that buffing will flow the deposit over the pinholes and seal them. A twenty minute copper deposit may be insufficient and we would suggest you try a heavier plate.

Immersion Rhodium Bath

Question: I have long enjoyed your section on "Shop Problems" in METAL FINISHING. Our problem is to deposit rhodium on an electronic contactor, about 1" square, made of plastic with hundreds of small copper contacts in the plastic. The customer desires a coating of rhodium on these copper contacts. It would be impractical to consider making a contact on each individual contact and therefore we are more concerned with immersion rhodium, if possible.

Any information you might give us on this subject will certainly be appreciated.

J. P. M.

Answer: An immersion rhodium bath, suitable for deposition on copper, was patented recently by Suchoff and assigned to the U. S. Army (U. S. Pat. 2,702,252. Feb. 15, 1955). The process was originally suggested for printed circuits and consists of immersion at about 80 deg. C. in an acidified solution of rhodium chloride. The rhodium chloride content should be between 10 and 20%, dissolved in a 5-50% solution of hydrochloric acid.

Drying Plated Parts

Question: We are seeking information as to the methods and apparatus for the drying of small pieces nickel or zinc plated, chromated, after electrolytic treatment in barrels, and that must be perfectly dry prior to their packaging. Same problem for the drying of larger pieces, treated on racks.

R. B.

Answer: Nickel plated parts can be dried perfectly either by baking in an oven at about 225°F. or by immersion in a water-displacing solvent, followed by degreasing to remove the solvent. Chromated zinc parts will not stand high temperature drying but the water-displacing solvent method should be suitable.

Professional Directory

SCIENTIFIC CONTROL LABORATORIES

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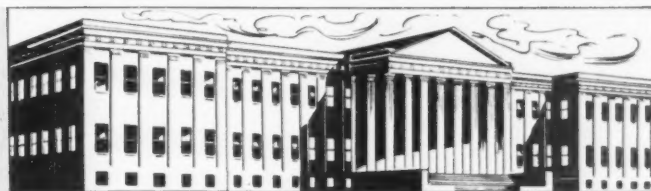
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Patents

RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD



Bright Copper Plating

*U. S. Patent 2,737,485. March 6, 1956.
D. M. Overcash and R. B. Parks, as-
signors to General Motors Corp.*

A copper plating electrolyte which consists essentially of an aqueous cyanide type copper plating solution to which is added zinc within the range of 0.05 to 0.15 ounce per gallon of solution, lead within the range of 0.0005 to 0.002 ounce per gallon of solution, selenium 0.0005 to 0.002 ounce per gallon of solution, di-potassium tartrate within the range of from 0.1 to 5 ounces per gallon and a quaternary amine in an amount within the range of 1 to 10 ccs. per gallon of solution.

Electroplating Apparatus

*U. S. Patent 2,737,488. March 6, 1956.
A. N. Gray, assignor to Western Elec-
tric Co., Inc.*

Electroplating apparatus, which comprises an electrolytic cell having an opening in the bottom thereof, means for maintaining an electroplating solution at a predetermined level above the bottom of the cell, a seal mounted at the opening for preventing leakage of the solution from the bottom of the cell while permitting a wire being electroplated therein to advance vertically therethrough, an anodically charged electrode immersed in the solution in the cell, a plurality of arcuate conductors closely spaced in end-to-end and side-to-side relationship to form a series of rings encircling the wire, resilient means for urging the conductors in each of the rings radially inward into contact with the wire, means for impressing a negative potential upon each of the rings to make the wire cathodic in the cell, a hollow rubber sphere enclosing the rings and the adjacent portion of the wire, said sphere being provided with a pair of vertically aligned apertures on opposite sides thereof and of such size as to permit the wire to advance therethrough but to form a substantially liquid-tight seal therewith, and means for supporting

the sphere closely adjacent to the level of the surface of the electroplating solution.

Hot Dip Aluminum

*U. S. Patent 2,738,289. March 13, 1956.
W. Hodge, assignor to Surface Com-
bustion Corp.*

In a process of providing a ferrous metal with a hot-dip coating consisting essentially of aluminum, the steps of preparing the cleaned surface of the ferrous metal to receive such coating, by providing on such surface a coating of an aqueous solution of an alkaline salt of an oxyacid of phosphorus with an alkali metal, having a concentration from .05 to 2 per cent, and drying.

Salt Bath Descaling

*U. S. Patent 2,738,293. March 13, 1956.
H. R. Spence, assignor to Diamond
Alkali Co.*

A composite salt for a metal cleaning salt bath process, consisting essentially of, on a weight basis, sodium hydroxide and sodium nitrate in approximately equal parts and potassium hydroxide in an amount not in excess of about 10% of the total weight of said salt.

Salt Bath Descaling

*U. S. Patent 2,738,294. March 13, 1956.
H. R. Spence, assignor to Diamond
Alkali Co.*

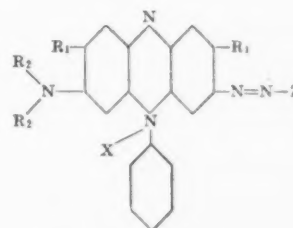
In a salt bath system, a composition consisting essentially of, sodium hydroxide from about 70% to about 98%, potassium hydroxide from about 0.5% to about 12% and the balance substantially an alkaline earth metal halide.

Acid Copper Brightener

*U. S. Patent 2,738,318. March 13, 1956.
R. A. Fellows, E. W. Hoover and H.
Brown, assignors to The Udylyte Re-
search Corp.*

A bath for the electrodeposition of copper comprising an aqueous acidic solution of copper salts, a safranine,

minor proportions of at least one compound selected from the group consisting of thiourea, N-acetyl thiourea, N-propionyl thiourea, N-trifluoroacetyl thiourea, N-pentafluoropropionyl thiourea, N-furfuroyl thiourea, dimethyl thiourea, cyanoacetyl thiourea, and a compound having the structure:



wherein R_1 and R_2 are radicals selected from the group consisting of hydrogen, methyl and ethyl radicals, X is an anion selected from the group consisting of chloride, bromide, iodide, fluoride, sulfate, bisulfate and nitrate, and Z is an aromatic radical selected from the group consisting of phenyl, naphthyl, and phenyl and naphthyl radicals substituted with amino, alkyl substituted amino, hydroxy and alkoxy substituent groups.

Automatic Plating Conveyor

*U. S. Patent 2,738,321. March 13, 1956.
V. Finston, assignor to The Meaker Co.*

In an electroprocessing apparatus, a stationary framework including a plurality of support columns, an upper frame, a closed track supported thereon, an intermediate frame therebelow, a series of processing tanks arranged beneath said track, a counterbalanced elevator frame including guiding means for movably engaging said columns, elevator drive means carried on said framework for vertically moving said elevator frame, a plurality of work carriers, each including a carriage, upper and lower rollers on said carriage engaging upper and lower surfaces of said track to prevent pitching movement of said carriage, a pair of dependent spaced guide bars secured to said carriage outwardly of said

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track, a tie bar secured across the lower ends of said guide bars, and a work holder having a flanged shoe slidably confined between said guide bars and supportable on said tie bar and having like integral work carrying arms extending oppositely therefrom, a sectional guide rail extending along and above said tanks and spaced relative to said track to slidingly contact the shoes of said carriers at all times holding the guide bars vertical against a gravity bias, said rail having fixed sections carried by said intermediate frame and alternately thereof aligned movable sections carried by said elevator frame, a roller carried by said shoes interengageable with said movable sections when the same are elevated above said fixed sections for movably supporting said work holders in raised position, a conveyor chain inwardly of said track, a conveyor drive means therefor, said carriages having chain supporting members extending over said track for attachment at equally spaced intervals to said chain, a cam plate carried by each of said members having spaced teeth extending inwardly of said chain, a control circuit for said elevator and said conveyor drive means including a conveyor limit switch carried by said upper frame and operated by said teeth moving therepast, an upper and a lower elevator limit switch carried on said framework and operated by said elevator frame moving thereagainst, said drives being alternately actuated by successive operations of said switches, and electrical means for supplying electrical current to said fixed rail sections for conduction to said shoes, said fixed rail sections and work holders being electrically conductive to supply current to work pieces carried by said work holders.

Full Automatic Plater

*U. S. Patent 2,738,888. March 20, 1956.
G. Todd and P. A. Hauck, assignors
to Hanson-Van Winkle-Munning Co.*

In a processing machine, the combination of an elevator raising and lowering workpiece carriers, a conveyor advancing with a stepwise movement carriers supported by the elevator in raised position and spaced apart, the elevator operating in the periods of rest of the conveyor, a second elevator raising and lowering the carriers, a second conveyor, which advances with a stepwise movement carriers sup-

ported by the second elevator in raised position and at a spacing different from the spacing, at which they are advanced by the first conveyor, and means receiving the carriers from the first elevator and delivering them to the second elevator at said different spacing, said means including a plurality of a series of spaced supports and reciprocating means for advancing the carriers along the series of supports.

Pickling Waste Treatment

*U. S. Patent 2,739,040. March 20, 1956.
E. B. Mancke, assignor to Bethlehem Steel Co.*

A process of regenerating spent sulfate liquor containing not less than 10 per cent by weight of iron sulfate and between 5 and 10 per cent by weight of free sulfuric acid which comprises treating said liquor in the presence of an oxidizing agent of the group comprising air, oxygen and oxygen-enriched air at a total pressure not less than 450 p.s.i. and at a temperature of not less than 350°F. for a sufficient time to precipitate at least 60% of the iron as basic ferric sulfate, then separating the said precipitate from the liquor.

Nickel Phosphide Coating

*U. S. Patent 2,739,107. March 20, 1956.
H. E. Ricks, assignor to Westinghouse Electric Corp.*

In the process of producing imperforate protective coatings on a body of a metal selected from at least one of the group consisting of molybdenum, titanium and zirconium and alloys comprising at least 50% by weight thereof, the steps comprising electroplating on the entire surface of the body of the metal a thickness of the order of 0.001 inch of a metal phosphide composed of at least 85% metal and the balance being phosphorus from an electrolyte containing the chloride and from about 4 to 6 ounces per gallon of phosphite of at least one metal from the group consisting of nickel and cobalt, and heat treating the body of the electroplated metal phosphide coating at a temperature of from 600°C. to 1,100°C. in a non-oxidizing, inert atmosphere to melt the electroplated coating so as to render it imperforate and to diffuse it into the body of the metal, the melted coating composed of from 90% to 99% by weight of the metal and the balance being phosphorus.

Chromium-Nickel Alloy Bath

U. S. Patent 2,739,108. March 20, 1956.
M. F. Quaely, assignor to Westinghouse Electric Corp.

The process of depositing chromium-nickel alloy on a member comprising immersing the member in an aqueous electroplating electrolyte comprising essentially 150 to 350 grams per liter of chromic acid and from 13 to 60 grams per liter of nickel chloride (NiCl_2), the ratio of weight of chromium to nickel in the electrolyte being from 4:1 to 14:1, and passing a plating current through the member at a current density of from 400 to 2,000 A.S.F., the temperature of the electrolyte being maintained at below 40°C. to electrodeposit a bright plating of the chromium-nickel.

Black Chromium Bath

U. S. Patent 2,739,109. March 20, 1956.
M. F. Quaely, assignor to Westinghouse Electric Corp.

In the process of electrodepositing an adherent and highly heat-resistant black finish on a member, the steps comprising making the member a cathode in an aqueous electroplating electrolyte comprising essentially from 150 to 350 grams per liter of chromic acid, from 13 to 60 grams per liter of nickel chloride (NiCl_2) and from 2 to 10 grams per liter of vanadium present as a soluble compound, the ratio of chromium to nickel to vanadium being 20:1.5 to 7:1½ to 2½ parts by weight and passing a plating electrical current through the member at a density of from 400 to 2,000 A.S.F., the electrolyte being maintained at a temperature of below 40°C.

Plating Rack

U. S. Patent 2,739,117. March 20, 1956.
H. C. Lueschauer and A. F. Erickson, assignors to General Motors Corp.

A fixture for holding a plurality of workpieces to be immersed in a bath for electroplating of the workpieces, said fixture comprising, a hollow core into which an electrode of the electroplating apparatus is adapted to be inserted, said core having a plurality of flat sides secured together at their longitudinal edges, a contact clip secured electrically and mechanically by fastening devices at each corner of said hollow core and extending longitudinally parallel with the respective corner and between which semi-cylindrical

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dric bearings are adapted to be inserted so that the bearing edges engage the respective outer sides of the core with their concaved surfaces facing the outer sides of the core, said clips each including a rigid bar portion having edge slots extending transversely inwardly into the bar for adjustable movement of the clips on the fastening devices parallel to the respective corners and a plurality of flexible fingers projecting from the bar portion angular to the bar portion and substantially normal to the core side adjacent to which the fingers are disposed, all interior surfaces of the core being coated with an electrical insulating material, electrode support means extending transversely across said core at one end thereof and including an insulated member through which an electrode is adapted to extend to position the electrode equidistant from the several sides of the hollow core, said core sides each having openings disposed linearly longitudinally thereof with each opening providing a bearing station and providing for directing of the electroplating forces through said sides against concaved bearing surfaces facing the sides.

Rotary Wire Brushes

U. S. Patent 2,739,332. March 27, 1956. A. J. Flohr, assignor to John C. Ward.

A rotary wire brush comprising a resilient rubber element composed of a solid resilient hub portion and integral resilient side disc portions normally projecting in substantially parallel planes from the hub portion, the hub portion and the side portions providing an annular channel, an annular series of wire bristles arranged within the channel and projecting beyond the side portions, a mounting ring for the bristles normally concentric to the hub portion, located adjacent the base of the channel and about which the bristles are bent at points between their ends and from which they project radially, the rubber element including an annular zone of resilient rubber in which the retaining ring and parts of the bristles within the channel are embedded, the embedding zone being concentric to the hub portion and the rubber thereof connecting the side portions providing resilient shields, the bristles and the mounting ring during the application and release of the working pressure of the brush having a floating relation relatively to the

hub portion and the embedding zone, the side portions being laterally yieldable in outward directions to permit spreading of the bristles under the pressure with which the brush is applied to the work and to provide lateral shock absorbing shields for the bristles, and metal plates provided at the sides of the element for mounting the brush in a centered relation upon an operating shaft, the side portions projecting for a suitable extent beyond the plates and having their yielding action limited to the extent of their projection beyond the cushioning hub portion.

Sandblasting Pipe Interiors

U. S. Patent 2,739,424. March 27, 1956. M. E. Fritze, assignor to Donald E. Hilliard and J. C. Fennelly Co., Inc.

A method of sandblasting the interior of a pipe or the like, which comprises directing a stream of particulate material generally axially within the pipe, deflecting such stream radially in all directions at once in the general form of a conical sheet of particles against the walls of the pipe, and shifting the deflected cone of particles axially along the pipe.

Burnishing Machine

U. S. Patent 2,739,426. March 27, 1956. C. C. Kinker and J. J. Murtagh, assignors to Gerity-Michigan Corp.

In a burnishing machine having a burnishing compartment, means to convey articles through said compartment, means to wet said conveyed articles with a burnishing liquid, a burnishing belt having a run operating against a conveyed article lengthwise of its movement and while wet with said burnishing liquid, said belt having on its outer surface a multiplicity of small pliable burnishing projections extending therefrom, and means for guiding and driving the belt.

Rotary Brush

U. S. Patent 2,739,429. March 27, 1956. R. O. Peterson, assignor to The Osborn Mfg. Co.

A rotary brush having a cylindrical shell with numerous apertures there-through, grooves in the exterior surface of said shell extending generally parallel to the shell axis and interconnecting rows of such apertures, brush strip helically wound on said shell, means affording clearance between ad-

jacent turns of said strip to permit fluid flow from the interior of said shell through such apertures and grooves and between the turns of said brush strip to the brush face, means closing the ends of said shell to provide a fluid containing cavity, and means for introducing fluid axially of said shell.

Vapor Phase Inhibitors

U. S. Patent 2,739,370. March 27, 1956. M. Senkus, assignor to Daubert Chemical Co.

A vapor phase inhibiting composition for inhibiting corrosive attack on metal by elements normally existing in the atmosphere comprising, as essential ingredients, an organic amide, an inorganic metal nitrite, and a salt of benzoic acid selected from the group consisting of sodium, potassium, lithium, calcium, magnesium, barium, aluminum and iron, said ingredients being present in the ratio of about 1 part by weight of said nitrite to 0.05-20 parts by weight each of said amide and said salt of benzoic acid.

Vapor Phase Inhibitors

U. S. Patent 2,739,371. March 27, 1956. M. Senkus, assignor to Daubert Chemical Co.

A vapor phase inhibiting composition for inhibiting corrosive attack on metal by elements normally existing in the atmosphere comprising, as essential ingredients, an organic amide, an inorganic metal nitrite, and at least one member selected from the group consisting of amine and ammonium salts of carboxylic acids selected from the group consisting of caproic, caprylic, 2-ethyl hexoic, phenyl acetic, p-hydroxy phenyl acetic, o-hydroxy phenyl acetic, lauric, palmitic, stearic, succinic, itaconic, aconitic, phthalic, adipic, salicylic, hydroxy benzoic, pimelic, hexahydrobenzoic, music, azelaic; and aromatic acids represented by the formula $(R)-Ar-(COOH)_n$ where R is selected from the group consisting of halogen, nitro, hydroxy and aliphatic hydrocarbon radicals containing from 1 to 5 carbon atoms, Ar is an aromatic hydrocarbon radical, v is zero to 2, and n is 1 to 2, said ingredients being present in the ratio of about 1 part by weight of said nitrite to 0.05-20 parts by weight each of said amide and said salt.

ABSTRACTS

Phosphating of Metals

J. Bary: *Metaux*. No. 350, pp. 399-403 (1954).

The author provides a survey of the theory and development of phosphating techniques and of the characteristics of the coatings. The processes today can be classified into heavy and thin coatings. With the first, which give the most effective protective phosphating, dipping times of 15 to 16 minutes are given, by which coating thicknesses of up to 0.325 g./sq. dm. are obtained. Subsequent protective coatings of a baking lacquer increase the corrosion resistance very considerably. Thus, in the salt spray test, visible oxidation occurred after 3 hours with the non-treated steel sheet; with heavy phosphated steel sheet without lacquer after 8-10 hours; after greasing of heavy-phosphated steel sheet, after 50 hours; with phosphate and subsequent treatment with an air drying lacquer, after 100 to 150 hours; with polymerization of the lacquer coating by baking, after 200 to 250 hours.

Light or thin phosphating serves mainly as a base surface for paint and lacquering, in order to prevent corrosion by scratches, pores and other damaging of the phosphate coating. The dipping times are between 30 and 80 seconds at 25 to 80°C. and give coat-

ings of 0.02 to 0.05 g./sq. dm. Greasing cannot be considered with these thin coatings, but subsequent paint and lacquer treatment can give just as good a salt spray test resistance as with deep phosphating.

Comparison Between Chemical Pickling and Mechanical Scale Removing Methods for Steel

O. Peltzer: *Stahl und Eisen*. Vol. 75, No. 3, pp. 129-140 (Feb. 1955).

One of the principal economic drawbacks of scale-removal by pickling of steel products from the rolling mills, is the water question and the treatment costs of the waste pickle liquors. The question is a vexing one because legislation most often prohibits the running into the public sewage system of strongly acid liquors and also the discharge of these into rivers or canals and, consequently, it becomes necessary to install and operate an effective neutralization system. Test-scale plants which have been erected for the treatment of pickling waste liquors have represented in fresh knowledge being obtained in this direction.

Chemical treatment of the waste liquors does, of course, serve to increase the pickling costs. Thus the pickling operation not only has to carry the operational charges of capital investment, maintenance and depreciation, water, fuel, electric power, acid, inhibitor additions, etc., but also, the costs involved in the treatment of the waste liquors. This treatment not only has to cover the neutralization

treatment of the residual acid and of the iron sulfate but also has to cover the handling of the sludges which are formed by this treatment. Working-up of the pickling waste liquors, i.e. the recovery of the iron sulfate salts with the present stand of technical development, is an uneconomic process as the operational costs are not covered by the amount realized for the recovered iron sulfate.

In Germany, at any rate, and this probably holds good for many steel plants in other countries, it is fairly safe to say that of around 600 or more plants which are concerned with steel bar production, steel sheet rolling or wire drawing processes with associated pickling treatment, not ten per cent are in a position to say what are their actual pickling costs and, what is more important, what it would cost if adequate equipment had to be installed for treatment of the waste pickle liquors instead of just running them away untreated to waste as is largely practiced at the moment.

After detailed discussion of chemical pickling treatments and a cost survey of these processes and the treatment of the waste pickle liquors, the author considers in detail the advantages of mechanical scale removal from bar steel by shot blasting methods, which obviates waste liquor disposal. The working details of the three different types of mechanical descaling processes are discussed and the machines considered. The shot-blasting method essential to these processes, is cost-surveyed. Operating costs for sheet and bar steel scale removal are worked out and compared with acid pickling.

Purpose of Phosphating

- Increase in corrosion resistance of protective coatings
- Ditto with a zinc or cadmium coated base
- For subsequent treatment by greasing or waxing of the phosphate coating
- Protection against surface wear
- Cold forming and shaping (drawing, rolling, extrusion, pressing)
- Electrical insulation

Nature and Thickness of the Phosphate Coating g./sq. dm.

- FeHPO_4 0.003 to 0.006
- $\text{ZnHPO}_4 + \text{FeHPO}_4$ 0.016 to 0.040
- ZnHPO_4 0.016 to 0.040
- $\left\{ \begin{array}{l} \text{FeHPO}_4 + \text{ZnHPO}_4 \\ \text{MnHPO}_4 + \text{FeHPO}_4 \end{array} \right\}$ 0.300
- $\left\{ \begin{array}{l} \text{FeHPO}_4 \\ \text{MnHPO}_4 \\ \text{NiHPO}_4 \end{array} \right\}$ 0.05 to 0.1
- $\left\{ \begin{array}{l} \text{ZnHPO}_4 \\ \text{FeHPO}_4 \end{array} \right\}$ 0.05 to 0.2 according to degree of forming
- $\left\{ \begin{array}{l} \text{FeHPO}_4 \\ \text{MnHPO}_4 \\ \text{ZnHPO}_4 \end{array} \right\}$ 0.350 and over

Process for Steel-Chromium Diffusion from Gas Stream by Ceramic Fill Materials

G. N. Dubinin: *Westnik Mashinostrojenija* (Journal of Machine Construction and Design—Russia). Vol. 33, No. 12, pp. 69-70.

Among the known diffusion chromizing processes for steel parts, the process of chromium deposition on the steel surface from the gas phase is the most perfect technically, because with this process the chromium deposited on the surface can be conveniently and precisely controlled. The author describes two processes.

With the first process, the component parts to be chromized are placed

in a container which is provided with a seal-containing chamber of ferrochrome or chromium. A gas mixture of hydrogen and hydrochloric acid gas can then be passed through this chamber. With the second process there is first conducted an enrichment of ceramic filling material with chromium chloride in an air-tight container. After this, the parts to be chromized are imbedded in the ceramic filling material and the chromizing then conducted, full details being given of the operation.

Steel Surface Treatment by Saturation-Alloying for Increased Resistance to Heat and Corrosion

G. N. Dubinin: *Westnik Mashinostrojenija* (Journal of Machine Construction—Russia). Vol 33, No. 8, pp. 74-79.

Tests were made in an oxidizing atmosphere (air) after saturation of the surfaces with various metallic elements by the gaseous phase method, in which the alloying metal is vaporized as a metal salt (usually chloride) and precipitation-reduced on the metal surface being treated in a hydrogen atmosphere. The test pieces were of iron (0.03% carbon) and steel (carbon 0.15 and 0.85%). The alloying surface treating metals were chromium, tungsten, molybdenum, vanadium, manganese, niobium and cerium. For cerium, the method used was vacuum volatilization of ferro-cerium at a temperature of 1,100°C. for 8 hours. With all other metals, the impregnation temperature was 1,200°C. for 3 hours.

The heat resistance tests were conducted at 900, 1,000 and 1,100°C. also 800°C. for chromium and niobium treated test parts. Control tests were made with untreated parts. With the test results it was found that chromium was outstanding and only niobium approached it in some cases, more particularly with steel of 0.85% carbon. As for the other elements, it was found that they had little or no effect in increasing high temperature resistance and may even decrease it.

Regarding the precise action which could be exerted by the alloying element, with respect to the oxidation scaling of steel, it is known that the establishment of oxide phases at the surface is largely governed by reaction of the oxidizing gas with the basic metal and bilateral diffusion of oxygen of the ambient medium with atoms of

the base metal towards the outer surface of the oxide film. First then, this oxide film is formed, then secondly a thin layer of scale. Experiments have shown that, in the oxide films of chromium treated iron and especially of steel, there is a carbide phase at the surface; also, in some cases with niobium treated steel, distinguished by high strength even after prolonged testing for heat resistance. This is not observed in surface diffusion-alloying with other metals but rather an easily broken up and friable oxide film. Heat resistance also depends on the thickness of the alloy surface layer.

Molybdenum Coated Steel — Structure, Corrosion and Heat Resistance

W. Koehler: *Werkstoffe und Korrosion*. Vol. 6, No. 5, p. 235.

The molybdenizing of a steel surface is conducted either by powder mixtures (molybdenum or ferro-molybdenum powders in a hydrogen atmosphere) at 900 to 1,200°C. with an applied coating thickness of 0.60 mm. or else in the gas phase with molybdenum powder, and a $H_2 + HCl$ gas mixture, under the same conditions. The molybdenum diffusion coatings obtained possess a good resistance to the action of hydrochloric acid. Extensive molybdenizing tests were conducted with mild steel and carbon steel with 0.47% carbon in gaseous molybdenum chloride in the presence of hydrogen at 1,300°C. for a duration of 6 hours. The coating obtained in this way was 0.6 mm. thick, consisting of a molybdenum diffusion coating, and possessed a Vickers hardness of 180 to 218 kg./sq. mm. It was characterized by a good heat resistance up to 900 to 1,100°C. The carbon steel was decarburized as a result of the formation of molybdenum carbide. The molybdenized soft steel possessed increased corrosion resistance against 50% nitric acid, 83% acetic acid, and 26% hydrogen peroxide, as well as the carbon steel with 0.47% carbon against 37% hydrochloric acid.

Tungsten Coated Steel Surfaces

W. Koehle: *Werkstoffe und Korrosion*. Vol. 6, No. 5, p. 235.

Russian development work is covered comprising tungstenizing tests

which were conducted by the powder process (tungsten or ferro-tungsten powder, hydrogen atmosphere, processing temperature 900 to 1,200°C. and treatment time 2 to 4 hours). The coating thickness obtained was 0.1 to 0.3 mm. Tungsten coatings have also been obtained electrolytically by the fused bath process using a sodium tungstate melt at a temperature of 1,100°C., a treatment time of 15 hours giving a coating thickness of 0.25 mm. The tungsten coating can also be produced from the gas phase, using WCl_2 powder and a gas mixture of hydrogen and hydrochloric acid. The treatment temperature here is 900 to 1,000°C. and the treatment time 5 hours, giving a coating thickness of 0.08 to 0.21 mm.

Tungsten coated steels are characterized by a particularly high resistance to mineral acids such as nitric, sulfuric and hydrochloric.

The diffusion process and the structural changes which occur with the tungsten coating were studied in the case of tungsten chloride, obtained by the heating of ferro-tungsten with hydrochloric acid, a soft steel with 0.03% carbon being impregnated as well as a carbon steel with 0.47 and 1.03% carbon respectively. The treatment was conducted at 1,300°C. for 6 hours. The tungsten diffusion coating obtained on the steel was 0.40 mm. thick, and showed a Vickers hardness of about 500 kg./sq. mm. The heat resistance of the coating sufficed up to 900° to 1,000°C. and is thus not greatly advanced by the tungsten treatment. The steel with 1.03% carbon was strongly decarburized as a result of the formation of tungsten carbides, WC and W_2C ; the steel was decarburized down to 0.3 to 0.4% carbon. Tungstenizing treatment was found to increase the corrosion resistance of the soft carbon steel and of the steel with 0.47% carbon towards 26% H_2O_2 only relatively little; the corrosion resistance towards 37% HCl and 50% HNO_3 , on the other hand, was considerably improved in both cases.

Change of Thread Dimensions in Electroplating

A. S. Smirnow: *Westnik Mashinostrojenija* (Journal of Machine Construction—Russia). Vol. 33, No. 10, pp. 72-74.

The choice of the thickness of electroplated coatings is frequently incor-

rectly determined because of lack of adequate knowledge regarding the dimensional changes which occur on the plated part with the application of the plated coating. Extensive investigations were conducted on test parts of brass and steel, the main objective being the ascertainment of the dimensional changes which occur on the plated part with the application of the plated coating. Extensive investigations were conducted on test parts of brass and steel, the main objective being the ascertainment of the dimensional changes which occur with the part as a result of the plating treatment. Tables were prepared on the changes of the external and internal diameters and are presented in the text.

Possibilities of Increasing the Protective Action of Anodic Oxidation Films on Aluminum

G. Bolognesi: *Metallurgia Italiana*. Vol. 46, pp. 44-45.

Details are given of data presented at the anti-corrosion congress held in Milan recently. By double reaction in the porous anodic oxide film of insoluble salts imbedded in the film with oxidizing anions which are adhering to the metal (for example, chromates of lead, barium, strontium or also barium sulfate) the resistance towards sea water and sodium chloride solutions can be improved.

Anodic Oxidation of Aluminum and Aluminum Alloys in an Alternating Current Chromic Acid Bath

L. Guerrecchi: *Alluminio (Italy)*. Vol. 23, pp. 515-532.

Conditions for the formation of brilliant black anodic oxide coatings in chromic acid solutions are described, with their noteworthy adhesion, hardness and high corrosion resistance.

Accuracy Values and Statistical Control Methods in Plating Plants

B. P. Kotelnikow and N. S. Raibman: *Westnik Mashinostrojenija* (Journal of Machine Construction—Russia). Vol. 33, No. 4, pp. 85-89.

Some results are given of investigations which were conducted in order to establish accuracy characteristic

values and to introduce statistical control methods into electroplating plants. There was investigated in particular the flow production zinc plating and tin plating of mass production parts.

The deviation of the effective thickness of the plated coating from the theoretical frequency distribution was established for a batch of 200 to 300 parts (according to the Gaussian Defect Function) for an average coating thickness. Further, there was determined the relationship between the coating thickness and the average quadratic deviation. The values of the average quadratic deviation serve as a basis for the calculation of control diagrams for an introduction of the statistical control methods.

It is shown that it is quite possible to provide a degree of commercial accuracy for frequently occurring coating thicknesses. The application of the control methods described ensures a high quality of production in plating plants.

Determination of Thickness of Thin Nickel Coatings on Iron by Solution Process

G. Schikorr: *MetallOberflaeche*. Vol. 6, No. 4, pp. B49-51.

With the increased attention which is being devoted in specifications and standards to the thickness of plated coatings, it was found that, in the determination of the thickness of thin nickel coatings on iron, the test methods left something to be desired. A satisfactory testing process will comprise dissolving off the nickel coating without any appreciable attack on the iron and then determining the nickel analytically. This process, however, is somewhat complicated in comparison to other methods. The same holds good for the microscope test, in which fundamental errors can occur with the measurement of very thin coatings. The solution method would seem the simplest to apply, employing a method by which the nickel is dissolved without attack of the iron, so that the difference in weight of the test part before and after the solution of the nickel would provide the thickness of the nickel coating. This method would be suitable for practical control in the plating shop by the foreman, as being easy to execute. A drawback to this method is that one has to assume a uniform coating thickness; however

with experience with the test method, it is possible to obtain sufficient control over the working processes.

Various solution tests were tried. Anodic solution in sulfuric acid was found to give errors of the order of about 1 micron but, in unfavorable cases such as an applied current density of 6 amp./sq. dm., much larger errors. The chemical solution process appeared more promising. With fuming nitric acid, after the nickel is dissolved the iron should not be directly rinsed with water, as the dilute nitric acid formed during the rinsing can cause an appreciable attack on the iron. Before rinsing, an intermediate dip in chromic acid solution should be given, to provide passivation of the iron. With this process, test thickness values were found which, as a maximum, were 0.1 microns higher than the given values; this may be regarded as satisfactory. The solution test can also be conducted with a solution of 100 g. of sodium cyanide and 20 g. ammonium persulfate in 380 g. distilled water; 100 cc. of a 20% solution of this gave satisfactory results. The disadvantage compared with fuming nitric acid is the longer stripping time. With undercoatings of copper the danger of attack on the base metal is less; however, none of the solution processes were found suitable here.

Production of Bright Copper Coatings on Printing Rolls

W. G. Solochina: *Poligrafitscheskoje Proiswodstwo-Polygraphie* (Graphical Industry—Russia). No. 2, pp. 7-10 (1954).

In this report some shortcomings in the present methods of copper plating printing cylinder rolls are indicated as well as investigation methods and results regarding the influence of bath additions on the structure and characteristics of the metal deposited.

There is described the most favorable composition of the bath and a newly constructed apparatus for the measurement of the internal voltages. Details are given regarding the maintenance of constant bath conditions by progressive additions to maintain a constant percentage composition. Figures and diagrams are incorporated giving an overall picture of the copper plating methods and layouts used for handling the printing cylinders.

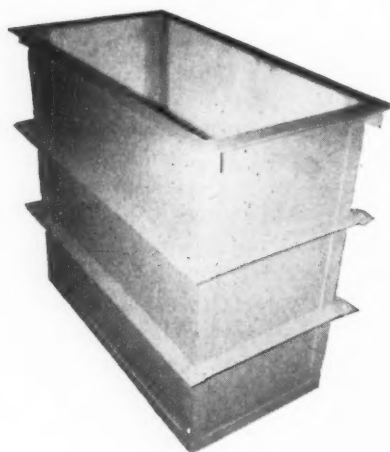
Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT
FOR THE METAL FINISHING INDUSTRIES



Fiberglass Tanks

*Plating Products, Inc., Dept. MF,
1509 N. Washington, Kokomo, Ind.*



The above manufacturer is now fabricating strong fiberglass tanks which, it is claimed, can be used successfully for chromic acid bright dips, acid dips, rinse after acids, plating solutions, etc. They are fabricated with strong chemically resistant fiberglass sheets which are joined together with a special resin bond, and are also heavily reinforced with sturdy fiberglass angles.

The tanks will not rust or corrode, which means long life, and are also lighter and more durable than other type of tanks. All tanks are made and designed to the customers needs and specifications.

Safety Solvent-Detergent

*Oakite Products, Inc., Dept MF, 118
Rector St., New York 6, N. Y.*

Composition No. 117 is a solvent detergent which combines through cleaning ability with safety factors. A clear solvent designed to remove grease, oil, and smut from machinery where water cannot be used, the new material has a flash point of 185°, Cleveland open cup. It has an exposure tolerance rating two and a half times greater than trichlorethylene and twenty times that of carbon tetrachloride.

The product is used full strength,

applied by brush, or immersion, or a non-atomizing spray. No rinse is necessary — parts may be blown dry with compressed air. For certain uses it is possible to use the material diluted with up to equal parts high flash petroleum distillate.

Lime Slaker

Infilco Inc., Dept. MF, Tucson, Ariz.

The "Viscomatic" lime slaker is claimed to depart entirely from any slaker now available. This equipment uses cold water and slakes quicklime in the form of a paste, rather than a slurry. By slaking as a paste, far more efficient lime slaking is accomplished since all the heat generated is used. Savings of lime up to 30% have been reported from actual field operation. Even poorer grades of quicklime may be used.

Additional advantages claimed for the lime slaker are:

(A) It requires no insulation, heat exchangers, high speed mixers, blender valves or hot water.

(B) Saves space—it is smaller than the conventional slakers.

(C) The grit conveyor is completely removable for servicing in the event of a breakdown.

(D) The slaking tank is designed for very easy cleaning, and flushing out when required.

(E) All paddles are constructed of abrasion-resistant materials having long life.

(F) The height of this slaker in all sizes allows direct access to the slaker top from the operating floor. The grit conveyor can be placed in a sump.

Cadmium Plating Specialties

*R. O. Hull & Co., Inc., Dept. MF,
1306 Parsons Court, Rocky River 16,
Ohio.*

The above manufacturer of plating specialties, announces four new products for improved cadmium plating.

Super XL Cadmium Brightener (liquid or powder) is an addition agent for cyanide cadmium plating and, according to the manufacturer,

produces the clearest, brightest barrel or still cadmium plate yet seen. Only small amounts are needed in the bath. In addition to brightness, it minimizes cadmium usage by improving uniformity of deposit with fastest production.

Cad-Sol is a pure, concentrated solution of cadmium cyanide for make-up or maintenance of cadmium plating baths without the troublesome and usually wasteful task of trying to dissolve cadmium oxide.

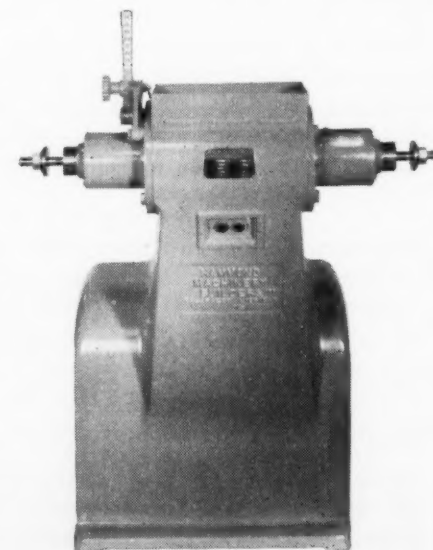
Cadip is used in small additions to the final hot water rinse to speed drying and to prevent discoloration of cadmium deposits, especially upon baking to relieve hydrogen.

Rodip CD-3 and CD-4 are single, short-dip chromate post-plating treatments without leach, for long-lasting, brilliant cadmium with good corrosion protection. CD-3 is formulated especially for use in automatic tank or barrel installations and CD-4 is for manual operations.

Polishing Lathe

*Hammond Machinery Builders, Inc.,
Dept. MF, 601 Douglas Ave., Kalamazoo, Mich.*

A new high speed polishing lathe has a shortened spindle, for hand finishing small parts such as automotive, aircraft parts and jet blades. The new lathe, designated as Model 5-ROL uses a 5 H.P. motor and has a speed up to



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The addition of SOLVAY Methylene Chloride to many aliphatics, aromatics, alcohols, ketones, esters and other solvents having flash points below 80° C. will produce mixtures that will meet I.C.C. standards for nonflammability.

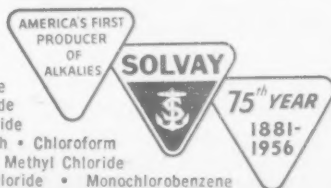
Write for helpful article "Methylene Chloride for Raising Solvent Flash Points . . . and Its Effect in 27 Solvents," a reprint from "Petroleum Processing," Nov., 1955.

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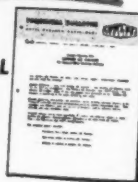
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See Cowles' other advertisements on pages 93 and 105.

6500 R.P.M. instead of the conventional lathe speeds of from 1400 to 3600 R.P.M.

The new model has dynamically balanced, ball bearing spindle, with either flat or multi-V-belt drive, and motor mounted inside heavy cast iron base. Drive belts are easily removable and can be replaced without removing or exposing bearings. The unit has a combination brake and switch, operated by a single lever for instantly stopping lathe spindle and cutting off motor current before brake is applied. Brake also locks spindle for wheel removal. Overhanging base permits handling of parts without base interference.

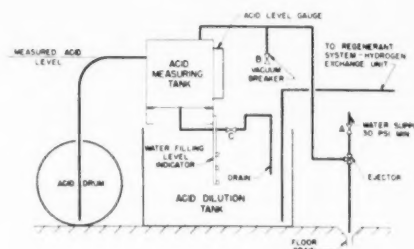
Safe Acid Handling System

Graver Water Conditioning Co.,
Dept. MF, 216 W. 14th St., New York, N. Y.

The above manufacturer is offering a method of acid handling which is of importance to plants using acid in carboys and drums. This equipment can be furnished as part of the regenerant system of water treatment processes such as demineralization, hydrogen zeolite ion exchange and acid stabilization. It provides a safe and simple method of handling any amount of acid that must be diluted with water.

Known as the Vacuum Acid Hand-

Graver
ACID HANDLING SYSTEM
(Vacuum Type)



ing System, it enables the transfer, measurement and dilution of acid to be accomplished without the necessity of lifting carboys or drums and without subjecting any vessels to positive pressures. Only a water line need be added to the system as furnished. The acid is drawn from the drum or carboy to the measuring tank by the vacuum created by the water operated ejector. When the proper amount of acid is in the tank, the flow is stopped by merely opening a vacuum breaker. Excess acid draws back to supply source. After the dilution tank is filled with water, the measured acid is drained into the dilution tank. The proper amount and concentration of acid is then ready for use in the regeneration system.

Rust and Paint Remover

Metasurf Corp., Dept. MF, 12830
Eaton Ave., Detroit 27, Mich.

R&P Stripper #27, a highly concentrated new type alkaline rust and paint remover is claimed to remove paint, phosphate coatings, rust, oil and other soils in a fast "one step" operation. It may be used in ordinary mild steel equipment and greatly reduces the number of operations normally required to obtain clean, rust-free metal surfaces. Unlike pickling solutions, it does not give off any obnoxious corrosive fumes.

Teflon Tubing and Lined Pipe

Haveg Industries, Inc., Dept. MF,
900 Greenbank Road, Wilmington 8,
Delaware.

The above manufacturer announces production of Teflon pipe and tubing and Teflon lined steel pipe. Pipe is being made in sizes up to 4" diameter; lined pipe in 2" sizes. It is also available in rods and special machine parts.

The material is completely inert to practically all chemicals. It has no known solvent, and is attacked only by molten alkali metals and fluorine at

elevated temperatures and pressures. It is completely resistant to nitric, hydrochloric, sulphuric and hydrofluoric acids. Also unaffected by highly oxidizing compounds such as aqua regia and sulphur or chlorine dioxides, it is resistant to abrasion and thermal shock, and will withstand 150 psi over a wide range of temperatures even below -90°F. , and is capable of continuous service to 500°F.

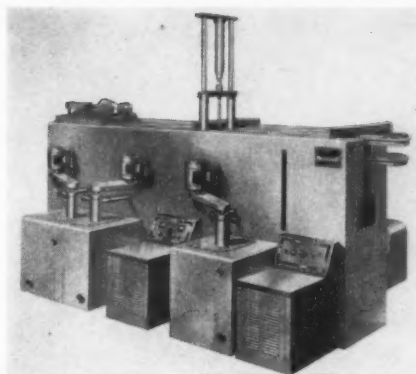
Ultrasonic Cleaning System

Ransohoff, Inc., Dept. MF, N. 5th & Ford Blvd., Hamilton 24, Ohio.

This new 5-stage machine combines a single ultrasonic cleaning stage with more conventional wash, rinse and dry sections. Parts are carried through the machine on a new and exclusive automatic indexing monorail conveyor.

In operation, the parts are loaded on fixtures traveling on the conveyor. They move through the following stages: 1) wash, 2) rinse, 3) ultrasonic cleaning, 4) rinse and 5) hot air drying.

In the washing, rinsing and drying sections, the parts are subjected to sprayed wash or rinse solutions or to



drying air. In the ultrasonic cleaning section, the parts are automatically lowered into the ultrasonic tank where high-frequency sound waves break contamination loose from the metal parts as no other method can.

Aside from the ultrasonic and automatically indexing conveyor features, the machine offers many other interesting details: Solution tanks and drying air are heated with electricity and temperature-controlled. The machine is placed in operation by pressing a single button; parts then proceed through the machine automatically, emerging thoroughly cleaned and dried.

Electropolishing Solution

Electro Glean, Inc., Dept. MF, 1075 Clinton St., Buffalo 6, N. Y.

A new, all purpose electrolytic polishing solution is claimed to polish to a mirror brightness both 300 and 400 grades of stainless steel, aluminum, and high and low carbon steels.

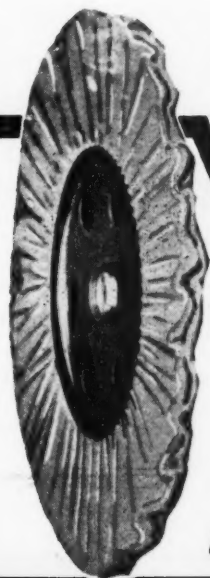
The concentration of this solution is not changed to polish these different metals, only the temperature, voltage and time are varied to attain the maximum brightness on any of these metals.

Low Foaming Spray Cleaners

Northwest Chemical Co., Dept. MF, 9310 Roselawn Ave., Detroit 4, Mich.

A new series of high efficiency spray cleaners, called "Jet" cleaners, thoroughly remove all types of production soil from zinc, copper, brass, and steel, according to the above manufacturer.

An unusual feature of the new cleaners is their low foaming action, even under conditions of high pressure and turbulence, hence a wider range of concentration can be used. Drain loss is cut to a minimum and greater operating economy is assured. Low foam-



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ing also permits the cleaner to carry a heavier dirt-load without redeposition and without the use of silicones or other hard to rinse chemicals.

The cleaners are non-toxic, harmless to racks and equipment, have no disposal problems and are dustless and non-caking.

Ultrasonic Cleaner for Small Parts

Branson Ultrasonic Corp., Dept. MF, 37 Brown House Road, Stamford, Conn.

A new ultrasonic cleaning apparatus, Model AP-10-B, the latest in the series of similar units, is a small, compact instrument, designed specifically for bench-top operation in the washing of delicate, intricate parts that must be "surgically" clean, such as watch mechanisms, instrument components, small and miniature ball-bearings, electronic parts, etc.

The new instrument comprises a 36-40 kc/sec. power generator, and a cylindrical cleaning tank, with transducers hermetically sealed into the base. RF power output of the generator



is 50 watts average, 200 watts peak on pulses. Tanks are of 1-pint, 1-quart, or 1/2-gallon capacity, giving a maximum effective cleaning area of 18 square inches. Two of the smaller tanks may be operated simultaneously, and two of the larger tanks alternately, depending on tank size specified.

Substantial economies in cleaning time may be effected, and a considerably lower temperature of the cleaning solvent is possible with ultrasonic equipment. Many soils normally considered insoluble may be removed. The generator and 1-quart transducer is priced at only \$350.00.

Water-Miscible Rust Preventive

E. F. Houghton & Co., Dept. MF, 303 West Lehigh Ave., Philadelphia 33, Pa.

A new multi-purpose rust preventive base can be mixed with water, solvent or oil, or used neat, it is claimed by the manufacturers.

Identified as Rust Veto M.P., this water displacing rust preventive base has an exceptionally wide range of uses for indoor protection. When mixed with water, it provides a safe, non-flammable emulsion with high stability and excellent protection value. It can be used to replace dangerous solvents or similar flammable slushes and is especially economical when mixed with water.

Liquid Coolers

Lundholm Mfg. Co., Dept. MF, 1121 Charles St., East Rockford, Ill.

Combination air and water cooled electric refrigerated liquid chillers give the industrial user a tandem system using water only as an auxiliary in excessive high production or extra hot weather.

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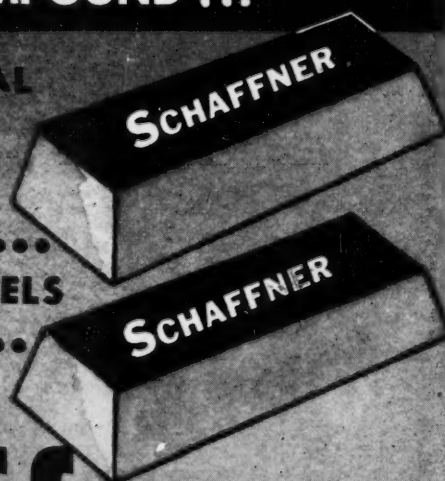
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(LIME) * EMERY CAKE * PLASTIC BUFFING COMPOUNDS * TALLOW GREASE STICK
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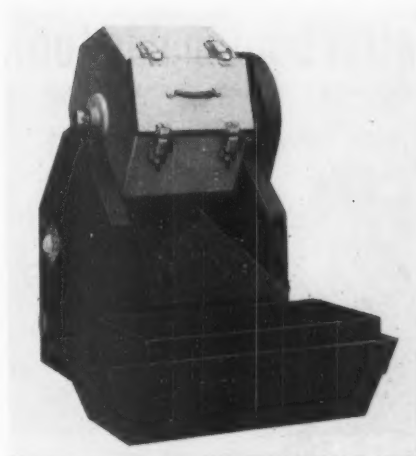
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When operating under normal conditions only air is used as a cooling medium for dissipating heat. When pressures exceed normal operation on the air cooled radiator, water enters the system relieving excessive high pressures automatically. As the pressure decreases the water is automatically shut off. This system is recommended in localities where water is scarce, or where the present drain systems are used to their near capacity. The liquid chiller eliminates large reservoirs which take up expensive floor space.

Small Lot Barrel Finisher

Mido Products, Inc., Dept. MF, 1801 Border Ave., Torrance, Calif.

A built-in unloading chute in the Mastercraft variable speed barrel finishing machine minimizes the handling of small parts or small lots in deburring or burnishing operations. Work pieces, abrasive media, water, and compound unload from the barrel opening down the chute, directly on to the separating screens, where the parts remain. Media can be reloaded into the barrel from the receiving pan.



Standard equipment includes a timer, 3/16 inch natural gum rubber vulcanized lining, screen, pan and wash-out door.

Process Control Chart

Wyandotte Chemicals Corp., J. B. Ford Div., Dept. MF, Wyandotte, Mich.

A process control chart which permits users of metal processing solutions to eliminate all figuring of quantities of chemicals necessary to maintain efficient strength, may now be used in

connection with the simple industrial test-kit, introduced in 1954, which has already proved its worth in many metal finishing departments even when used by non-technical personnel. The new chart is printed on a heavy, water-resistant grade of cardboard and is metal reinforced for hanging.

With the new chart, it is possible to post a permanent "make-up" record by each tank for the particular product in use. Required solution additions are read directly from the chart, thus permitting operators to maintain efficient solution strength without troublesome calculations.

The testkit gives a simple, non-technical, yet accurate procedure for instantly controlling solutions of:

- Alkaline Soak Cleaners
- Phosphating Cleaners
- Metal Etchants
- Electrocleaners
- Rust Removers
- Water Wash Spray
- Booth Compounds

The label on the case containing each testkit is color coded and plainly marked for use with the particular



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Manufactured and controlled in our own new modern up-to-date Buff plant. Can be tailor made for your toughest buffing problem

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"Plus-4" Anodes make better boot molds too!



A copper mold and one of the U. S. Rubber Co. Gaytees produced in it. Mold thicknesses vary from .035" to .090", depending on size and type of boot.



Each electroforming tank can plate 10 molds—uses standard acid-plating solution and 33 "Plus-4" Rolled Anodes, 1/2" x 8" x 20"—300 amps power input.

IN ELECTROFORMING—as in acid electroplating and electrotyping—ANACONDA "Plus-4" (Phosphorized Copper) Anodes are turning in superior performance records.

The Shoe Hardware Div. of U. S. Rubber Co. electroforms the copper molds used in the production of rubber and plastic rainwear known as Gaytees®. With ordinary anodes, they had been troubled with porosity and "treeing."

Nearly two years ago, they turned

to "Plus-4" Anodes and report the following advantages: 1. Extremely smooth plating, without "treeing." 2. Good grain build-up. 3. No porosity. 4. Uniform anode corrosion with consequent scrap reduction. 5. Savings in solution correction due to reduction of sludge and copper build-up. 6. All-round cleaner plate.

You have everything to gain and nothing to lose by setting up one acid-copperplating tank to test "Plus-4" Anodes. Send in the coupon today. 50141

The American Brass Co., Waterbury 20, Conn.
In Canada: Anaconda American Brass Ltd.,
New Toronto, Ont.

Give me details on how I can get a test supply of "Plus-4" Anodes sufficient to fill one tank.

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Made by The American Brass Company

For use under Pat. No. 2,699,216

product in use. At the time the product is installed the company representative completely fills in the process control chart which gives a permanent operating record.

Chemical Filter Unit

Sethco Mfg. Co., Dept. MF, 70-78
Willoughby St., Brooklyn 1, N. Y.

Model LSIN-30 rated at 350 gallons per hour filtering capacity, for filtering all common acid and alkaline electroplating and industrial solutions.

Features include: 1. Self Priming Pump: simply insert hoses into solution and turn on switch.

2. Hi-Flo rate: 400 gallons per hour open pumping capacity.

3. Full-view filtering: Transparent, high temperature, lucite filter chamber.

4. Economical operation: Back washing with reversing switch for longer cartridge life.

5. Compact and light weight: occupies 1 1/2 cu. ft., weighs only 75 pounds.

The unit consists of a high temperature, Lucite chamber which permits full view of filtration in progress, and contains three No. 10 filter tubes. Filter tubes are cotton or dynel wound around stainless steel core. Particles down to 1 micron in size may be removed from solution.

Pump is stainless steel 316, self priming with neoprene impeller. Pump will develop pressures of up to 35 psi during the filtration cycle.



Motor is 1/4 H.P., 110 Volt, 60 Cycle, 1 Phase, totally enclosed, ball bearing capacitor type, equipped with 3 wire grounding cord, feed-through switch and molded rubber grounding plug and adapter for 2 wire outlet. It is available with reversing switch (as optional equipment) to enable the operator to instantly clean out filter chamber without dismantling. Simply reverse motor with reversing switch.

Twenty feet pure gum reinforced 2 ply chemical acid hose are provided. Inlet hose is equipped with plastic strainer. All equipment is mounted on phenolic linen impregnated panel 16" x 18" x 1/2" thick, which is equipped with ball bearing rubber tire casters.

Color Anodized Aluminum

Industrial Parts Division, Reynolds Metals Co., Dept. MF, Louisville, Ky.

Color anodized aluminum tubing has been available to the furniture industry by the above manufacturer.

The tubing is available in natural aluminum, gold and blue. Each of these colors is available with the following finishes: (1) satin appearance, (2) semi-bright, and (3) bright with high lustre.

The tubing is available in 3/4-inch, 7/8-inch and 1-inch diameters, in standard wall thicknesses.

Abrasion and Corrosion Resistant Coating

Bradley & Vrooman Co., Dept. MF, 2629 S. Dearborn St., Chicago 16, Ill.

Spray Sterilkote is a new, sprayable, vinyl organosol coating claimed to have as much as 5 to 10 times greater

abrasion resistance than conventional enamels, good chemical resistance, absence of chipping, and flexibility for application to metal parts, giving a satin-like finish over metal surfaces. Available in practically any color desired by the customer, the coating is applied over a primer to a thickness of 0.001 to 0.004 inches. The primer is allowed to air dry for from 5 to 10 minutes, after which the top coat is sprayed on, using conventional paint spray equipment. The coating is then baked at normal schedules of 20 to 30 minutes at 360° to 375°F. Lack of tendency to run or sag and fast set-up time make possible higher production rates than are possible with the use of conventional baking enamels.

Polyethylene Drum

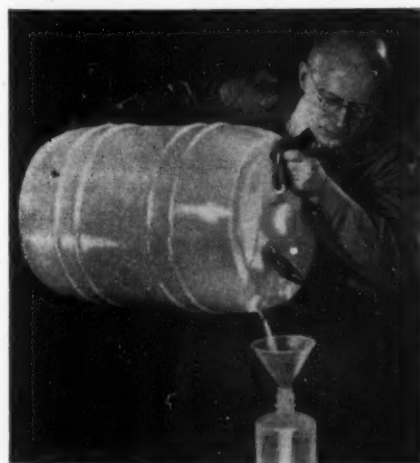
Plax Corp., Dept. MF, Hartford, Conn.

A new type, 13-gallon polyethylene drum, barrel-like in appearance and construction, is now in volume production. The container is an addition to the company's line of 5, 6½ and 13-gallon carboys.

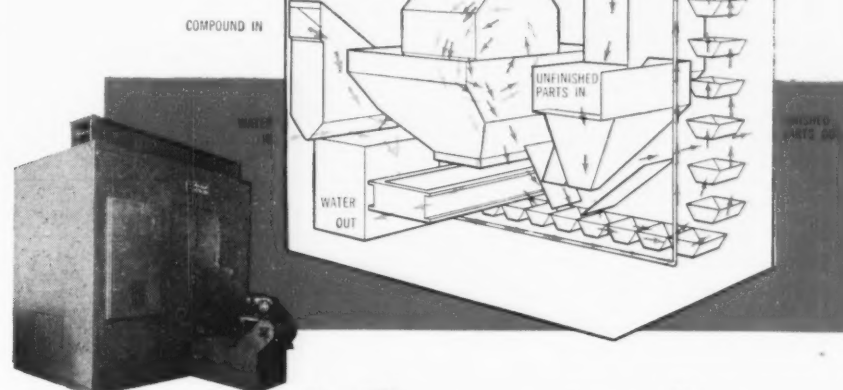
The heavy-duty container incorporates such features as two folding handles, pouring spout, separate opening for filling and venting, hand-grip on the bottom and strengthening ridges that permit the drum to be rolled on its side.

Complete provision has been made to permit stacking. Colored folding handles, and filling and pouring necks are located in a recessed area on the top of the drum. Top and bottom contours are convex to permit the containers to nest securely one on top of the other.

The container, made to a design originated in Italy by Montecatini and Pirelli, is lightweight, inert to corrosives and unbreakable. Arrangements



ROTO-FINISH LEADS AGAIN



the new "Rotomation" MACHINE

MAKES MECHANICAL TUMBLING A FULLY AUTOMATIC BARREL FINISHING PROCESS

- Completely Automatic
- Needs no operator in attendance
- Loads and unloads itself with each cycle.
- Cycle variable for different part requirements.
- Provides continuous operation
- Assures uniformity of finish
- Low cost operation — high production
- Complete package unit
- Simple to install . . . Electric, water, air and drain connections only.
- Suitable for straight line production.
- Thus, "Rotomation" barrel finishing machine becomes a machine tool.

Roto-Finish

3706 MILHAM ROAD, KALAMAZOO, MICH.



COMPANY

P. O. Box 988 -

Phone 3-5578

ORIGINATORS OF THE ROTO-FINISH PROCESS

are being made to secure I.C.C. approval.

Non-Flammable Corrosion Preventive

Dearborn Chem. Co., Dept. MF, Merchandising Mart Plaza, Chicago 54, Ill.

No-Ox-Id Safeguard, a new, water-based, non-flammable corrosion preventive for the protection of metal surfaces, is a water emulsion of waxes and oils in combination with selected corrosion inhibitors which, when applied to metal surfaces, provides an excellent, highly protective film. When applied by dip or spray, it forms a uniformly firm, wax-type coating. After a brief drying and curing period, this

coating cannot be reverted to emulsion, nor will it wash off during outdoor exposure. It is extremely adherent and is not appreciably affected by handling.

The product will also resist fingerprint corrosion, whether the metal part is subjected to handling before or after application.

Multi-Barrel Finishing Unit

BMT Mfg. Corp., Dept. MF, 101 E. 9th St., Elmira, N. Y.

Model MMB multi-barrel finishing unit for "slide-honing" small component parts, a smaller model of the standard 48" disc Model 2MB unit, requires less floor space and offers lower initial cost. A variable speed drive from 15 to 45 rpm, forward and re-

How to IMPROVE YOUR PLATING OPERATIONS with SEYMOUR BRIGHT NICKEL

TO OBTAIN THIS DEPOSIT USE THIS SEYMOUR BRIGHT NICKEL PROCESS

	*Type	Solution	Active	Method	Deposit
BRIGHT	C	Warm	Yes	Still	Decorative
BRILLIANT	NC	Warm	Yes	Still Barrel	Decorative Specification
ULTRA BRILLIANT	CK	Warm	No	Still Barrel	Decorative Specification
NORMAL NICKEL	R	Cold	—	Barrel	Decorative
BLuish TINT	NR	Cold	—	Barrel	Decorative
DEEPER BLUE	RS	Cold	—	Barrel	Decorative

(*) For best results use these solutions with SEYCAST 99% cast anodes. Write for SEYMOUR bulletins giving complete details.

SEYMOUR BRIGHT NICKEL PROCESSES efficiently deposit on steel and ferrous alloys, on brass and nonferrous alloys and on zinc-base alloys which have been previously copper-plated.

They give you these important features: —

- GREATER THROWING POWER to successfully plate deeply recessed articles.
- HIGH DUCTILITY (in all but the "CK" process) which permits further fabrication after plating.
- MINIMUM OF CONTROL with easy operation and freedom from hydrogen pitting.
- SAVINGS in time and money because active surfaces require no reactivation, cleaning or wiping before chrome plating.



THE SEYMOUR MANUFACTURING CO.
4 FRANKLIN STREET, SEYMOUR, CONNECTICUT

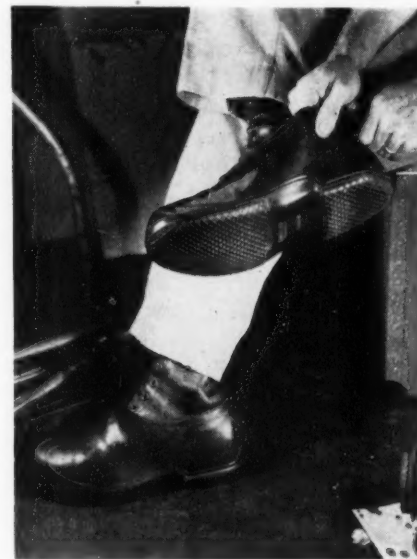


verse control, automatic safety switch, and threaded pipe connection for direct drainage to sewer outlets is provided. Up to ten finishing barrels 3" by 8" in diameter, hexagonal or round, can be mounted simultaneously for various finishing operations. Barrels are plain or plastisol lined, as desired, and are equipped with quick-mount adapter bases.

Molded Work Rubbers

*Tingley Rubber Corp., Dept. MF,
903 Ross St., Rahway, N. J.*

New "Hi-Top" work rubber is able to slip over wide-last safety shoes equipped with steel toe caps. Unusually high tops give extra protection against splashes, and one-piece molded design



eliminates fabric lining to make cleaning easier. The new lightweight rubbers are made in Neoprene for uses involving contact with oil and grease, acids and other chemicals, and exposure to sun.

Automatic Gas Valves

Electronics Corp. of America, Dept. MF, One Memorial Drive, Cambridge 42, Mass.

Fast closing and slow opening are features of the new line of Fireye Series 81L automatic gas valves. For use with Fireye flame safeguard systems, these motor-operated valves have a powerful compression-type spring that automatically shuts off fuel in 0.8 of a second. A special heavy-duty electric drive unit controls the rate of opening to reach 75 per cent of maximum fuel flow in six seconds.

Another feature is the availability of a position indicating switch, which performs as a safety interlock. If, prior to light-off of a burner, the valve is open as little as fraction of an inch, the switch will not allow the light-off to take place. Instead, the electric circuit to the burner control will remain off until the valve is completely closed.

In case of flame failure or loss of electric power, or on operation of limit switches or other interlocks in the burner control circuit, reliable closing of the valves is assured by two proved principles of construction. One is the "double safeguard" release, wherein either of two independent releases will trip the valve. A new "shearing action" by the valve disc, which literally cuts through dirt or scale on the valve seat, is the second.



Approved by Underwriters' Laboratories and Factory Mutual, these automatic gas valves are available in sizes from one to six inches. Higher capacities and lower pressure drops are achieved in each by full area port and straight-through body design.

Because they are constructed of heavy-duty materials, the life expectancy of these valves will exceed the associated fuel-burning equipment.

Current Recorder and Brightener Feeder

F. D. Pace Co., Dept. MF, 69-73 Scribner Ave., N. W., Grand Rapids, Mich.

The above firm has recently announced two new products. The first is a completely new electronic ampere-hour recorder, unique in that it attaches to the same shunt to which the ammeter is attached. This simplifies the installation. The instrument can be used with power equipment of any size, by using a simple multiplier, it is claimed.

In plating, the recorder can be used to control additions of chemicals to plating baths, to determine the weight of anodes consumed and to determine plating costs.

The second product is a britener feeder unit, to be used in conjunction with the recorder, which will make additions of britener automatically, in very small quantities, when and only when needed, according to the manufacturer.

The feeder unit is called an Automatic britener feeder. The output of the feeder can easily be varied to deliver from .1 qt. per hour up to 4.0 qts. per hour of solution. It consists of a plastic lined tank with a low level

TANK HEATING PROBLEMS ELIMINATED!

CLEPCO FUSED QUARTZ IMMERSION HEATERS

Heating your acid tanks with Clepco Electric Immersion Heaters is the most modern and now the most proven of all methods known today.

ASK YOUR LEADING PLATING SUPPLIERS

OVER 100,000 INSTALLATIONS PROVE CLEPCO FUSED QUARTZ IMMERSION HEATERS ARE BEST

Clepco Steel and Stainless Immersion Heaters are designed to meet the specific demands of the Alkaline Bath heating problems of the Industry.

WHEN A BETTER HEATER IS MADE, CLEPCO WILL MAKE IT.

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FUSED QUARTZ IMMERSION HEATERS



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WRITE US FOR LITERATURE

THE CLEVELAND PROCESS COMPANY

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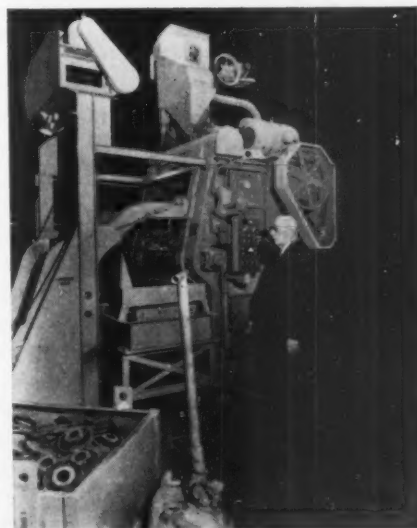
signalling device and a control and pump unit. The pumps can be furnished in stainless steel or in Teflon.

The britener unit is said to maintain a constant level of britener concentration which results in very uniform deposits from the standpoint of ductility and brightness as well. Tests have shown that lower britener concentrations can be maintained with the Automatic feeder with the same or better results.

Automatic Abrasive Blaster

Pangborn Corp. Dept. MF, Hagerstown, Md.

All operations of the new fully automatic Blastmaster Barrel including ma-



PIONEERS and LEADERS



in ELECTROLYTIC PRECIOUS METALS

Through the years, Davis-K has continued to lead the field in producing low cost solutions, time-saving procedures and revolutionary new electroplates. From Davis-K research laboratories have come two of the most outstanding developments in recent years.

ONE OPERATION

First with Antique Gold Solution

An inexpensive, quality electroplate with excellent color consistency and remarkable ease of operation.

First Again with HARD GOLD SOLUTION

FOR PRINTED CIRCUITS AND ELECTRONIC PARTS

Davis-K Hard Gold Plating Solution is an amazing new electroplate for the electronic industry which cuts gold deposit 50% while forming a lasting bond with either metals or plastics. Requires no elaborate set-up, has maximum resistance to high frequency, plates at low temperature and eliminates control problems.

OTHER DAVIS-K PRODUCTS

- ★ POTASSIUM GOLD CYANIDE SALTS
- ★ LUSTROUS WHITE RHODIUM SOLUTION

Now available: variable-type Tank Rheostats, specially designed for precious metal plating.

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As an added service, Davis-K process engineers are available for consultation concerning special plating problems and installations.

ALL DAVIS-K GOLD PLATING SOLUTIONS ARE:

- made in all colors
- color constant
- tarnish-resistant
- brilliant in finish
- bottled by Troy weight
- made from assayed US Treasury Gold only
- Ready for immediate use

We are fully equipped to reclaim old gold and rhodium solutions. No charge for small sample plating. Write Dept. MF-8 for details!

"Where Glittering Elegance Reflects Lasting Quality."



DAVIS-K
PRODUCTS, CO.

135 West 29th St., New York 1, N. Y.
Longacre 4-1978-9

terial handling, weighing, starting and stopping the rotation of the barrel are automatic.

The detailed cycle of operation begins with the loading of the skip by the incoming conveyor. When a load of predetermined weight is in the skip, a switch automatically stops the feeding conveyor. When the blasting cycle in the barrel is completed and the load discharged, the skip is automatically raised which dumps the dirty castings into the barrel. The skip returns to the loading position and is immediately filled with another load of dirty castings. The door of the barrel shuts, the barrel begins to rotate, the Rotoblast wheel begins to throw abrasive. After a predetermined period, the wheel stops

and a short period of tumbling takes place, to drain abrasive from work. The barrel stops, the door opens, barrel reverses direction, and the cleaned castings are dumped out of the barrel onto another conveyor which takes the castings to the next step in processing. The skip dumps in a new load and the cycle is repeated.

All of the steps in the cycle are controlled automatically. However, the blasting cycle can easily be changed in a matter of seconds, length to suit cleaning time required.

All controls on the barrel are electrical. All phases of the cleaning cycle can be controlled separately and manually, if required, by push-buttons on the control board.

Double-Sewed Unit Cloth Buff

American Buff Co., Dept. MF, 2414
South La Salle St., Chicago 16, Ill.



Greater versatility of buffing on stainless steel, carbon steel and aluminum is now possible by the use of a new patented centerless Unit cloth buff. Manufactured of superior quality cloth, the "units" of this new buff are sewed double

for firm, hard cutting. Unit edges are compactly folded upon themselves, giving a sturdy perimeter and leading edge that hold buffing compound longer.

An exclusive, patented centerless construction enables this new buff to run at higher speeds without burning or discoloring the work. Instead of being fastened to a solid center, the units are held together by a special gripping steel ring. This leaves space around the shaft through which cool air circulates in all directions.

In mounting the new buffs, a patented pre-assembly method saves valuable time. The proper number of sections can be locked together in advance, and mounted on a special hollow, flanged shaft. Slipping the complete buffing head on or off the machine takes only a few seconds, greatly reducing down-time. Due to the unique, simplified design of the steel clinch ring, an almost unlimited number of sections can be locked together, to build a buffing face up to twelve inches or even wider, with complete safety.

The new buffs are available in a complete range of densities and sizes for any automatic buffing use.

Automatic Process Control

The Swiss Colony, Dept. MF, Monroe, Wisc.

Ideal process conditions particularly important to the metal finishing industry may be accurately maintained with this new electronic-hydraulic control unit.

Providing exact control with a minimum of equipment, the compact unit solves control problems involving pressure, vacuum, temperature, liquid level, flow, or condensate drainage, and is adaptable to practically any manufacturing process.

The new unit's speed of action elim-

inates problems of lag and hunting. Only one moving part makes for almost friction-free operation and low maintenance cost. Installation is simple, involving three steps to make the necessary connections.

Each unit is custom-built to the customer's exact specifications, and is guaranteed for 30,000 hours of operation. Full purchase price of the unit will be refunded, if the equipment does not function to the customer's specifications.

Abrasive Wheel Dresser

Besly-Welles Corp., Dept. MF, South Beloit, Ill.

For better dresser performance at lower cost, there is now available a new, advanced functional design Type A "Wise" Dresser Cutter assembly. It lasts longer and picks, instead of crushes, the surface of the abrasive disc. These features, in addition to economical price, provide lower cost abrasive dressing, according to the manufacturer.

Two types of cutting wheel assemblies (as shown) are interchangeable on the same basic arbor, giving this dresser broader application possibilities for longer service life and better results. The "standard" type has a cutter blade assembly made up of six wheels with all fine teeth. The type "A"

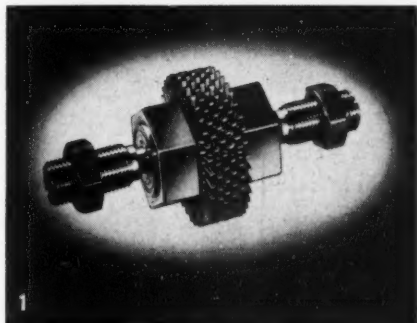


Figure 1. "Wise Type" Dresser Cutter Assembly showing standard fine tooth dresser cutter assembly.

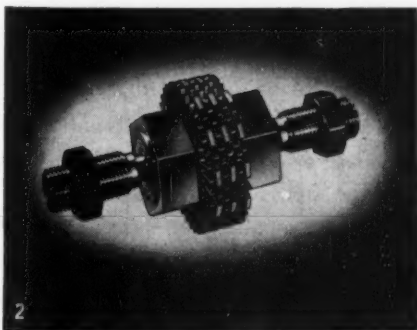


Figure 2. New "Type A" Wise Dresser Cutter Assembly showing alternate fine and broad tooth construction.



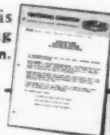
Put your metal cleaner *behind* the soil—between the soil and the metal—and you'll soon have the soil *off* the metal. That's the way you'll clean metal parts with . . .

Cowles NEW QC WASHING MACHINE CLEANER

Cowles NEW QC Washing Machine CLEANER penetrates through films of oil—crusts of drawing and stamping compounds—even into deeply recessed parts—pries the soil loose where pressure jets can't reach.

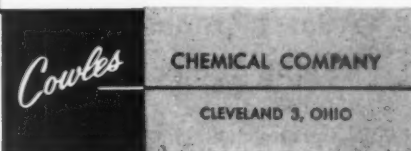
Improved penetrating, wetting, and emulsifying action in your washer without objectionable foaming.

GET THE COMPLETE STORY on this brand NEW Cowles QC Washing Machine Cleaner. Send This Coupon.



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Please send Cowles QC Bulletin

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Company _____
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City _____ State _____



See Cowles' other advertisements on pages 84 and 105.

has three wheels with fine teeth and three wheels with alternate fine and broad teeth, as illustrated in the photograph.

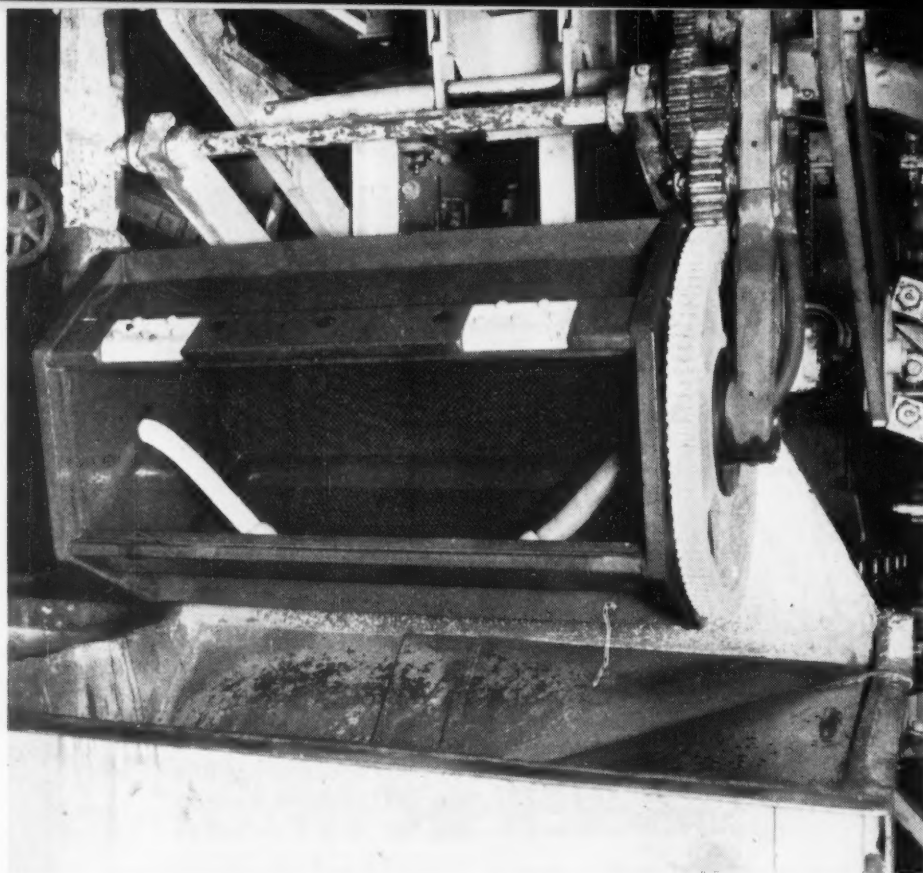
Almost frictionless rotation of the cutter assemblies is assured by sealed ball bearings holding the square arbor. Buttons pressed into the side of each individual cutting wheel eliminate the need for spacing washers, and speed assembly and replacement. It is priced at only \$9.05 each for complete dresser assemblies either type. Sets of 6 cutters either type, in quantities of 1 through 9 at \$1.50 per set, 10 or more at \$1.25 per set.

Further information may be obtained directly from the manufacturer.

Duplex Timer

Industrial Timer Instruments Co.,
Dept. MF, 189 West Madison St.,
Chicago 2, Ill.

A new electrical instrument timing component keeps running when power fails or circuits short out. Accurate to the split-second, the duplex movement runs electrically or mechanically and does not stop upon power failures like ordinary synchronous electric motors. It is a unique device consisting of an accurate synchronous electric time unit combined with a spring driven time unit which is held in reserve. If electricity should fail, the spring driven unit goes into action instantly. Not a second is lost in this transition.



THE BEST BARREL CYLINDER EVER MADE

After 13 Months Of Three-Shift Usage This Udylite Tempron Cylinder Shows Little Wear

This unretouched photograph shows a Udylite Tempron Barrel Cylinder which has been in use for thirteen months, most of the time in a "round the clock" operation. This cylinder looks like new.

Seams are tight and there is no warping although it has processed thousands of heavy loads of work through a complete cycle of *electro-clean, acid pickle, zinc plate, bright dip or dichromate and hot and cold rinses*. Most of these loads have been beyond our guarantee of 200 pounds per 14" x 30" cylinder.

In January, 1955 and after two years of exhaustive tests, Udylite formally introduced the Tempron Barrel Cylinder as the most efficient and long lived plating barrel ever offered. The vitality of Tempron and the durability of Udylite construction has now been convincingly proven in hundreds of operations.

During a recent twelve month period, a set of Udylite Tempron Barrel Cylinders has processed millions of pounds of work, mostly through the complete zinc cycle. Any measurement of wear is almost impossible.

Udylite Tempron Cylinders withstand, even under load, the highest temperatures used in plating. Withstand stronger acids. Have greater resistance to abrasion and can be used through the entire plating cycle.

Let us tell you more of the advantages of Udylite Tempron Cylinders or show you "on the job" examples. Write us today.



WORLD'S LARGEST
PLATING SUPPLIER

Metex Filter Aid

The rate of flow and clarity of the solution after it passes through a filter is greatly dependent upon the type of filter aid used in the filtering process. After hours of actual use and testing in the Udylite laboratories the Udylite Corporation recommends Metex Filter Powder to users of filter aids.

Metex Filter Powder contains no soluble matter to dissolve in the plating solution causing roughness of the plated deposit. The uniform interlocking fibers of the filter cake hold tightly to the filter cloths, plates, stones or screens regardless of the pressure applied, yet are readily removed when required. Due to the type of filter cake formed, cloth filter bags remain in their original soft pliable condition rather than becoming hard and cracked.

Metex Filter Powder is very economical. For example when used with the Udylite-Detroit 3-1000 Filter which has a rated flow of 1,000 gallons per hour only one and one-half pounds is needed. With the Udylite-Detroit 1-350 Filter only one-half pound is needed. Of course, the amount of filter aid to be added to any batch type purification depends upon the amount of contamination to be removed. Usually there is added to the solution to be purified an equal amount of filter aid and carbon. If carbon and permanganate are used, an amount equal to their combined weights is added. In filtering a cyanide solution, a quantity equal to carbon and sodium sulfide or any other material used for the purification treatment is added.

Round Lead Anodes

Round Lead Anodes by Udylite show increasing popularity month after month as compared to flat lead anodes. Sales increases are nation wide and not confined to certain specific areas.

The simple shape of Round Lead Anodes provides the greatest active plating surface area. The heavy cross-section withstands high current density without overheating. Less current is needed. Corrosive chromate buildup usually found on the side of the anode facing the tank lining is greatly re-

ADVERTISEMENT

duced assuring an even anode wear. Warping, long a problem in chrome plating, is eliminated by the use of Round Lead Anodes with their heavy cross-section.

Round Lead Anodes by Udylite offer economy to the user. Fewer anodes are required and with Round Anodes the entire circumference is conductive, resulting in better current distribution. You also get the maximum number of plating hours per anode. Cleaning is much easier to accomplish.

All Round Lead Anodes supplied by Udylite are completely fabricated of newly mined virgin tin and lead eliminating selective corrosion caused by foreign metal inclusions. The anodes are extruded, providing a dense non-porous structure.

Round Lead Anodes are furnished in two standard book sizes, 4-1/2 inches or 6-1/2 inches to meet varying anode rod sizes. Plastic coated hooks can be furnished if desired. All hooks have knife edged contacts. Shipment of hooks are made in specially designed wooden cases to assure delivery of straight unmarred anodes.

Forged-Copper Ball Anodes

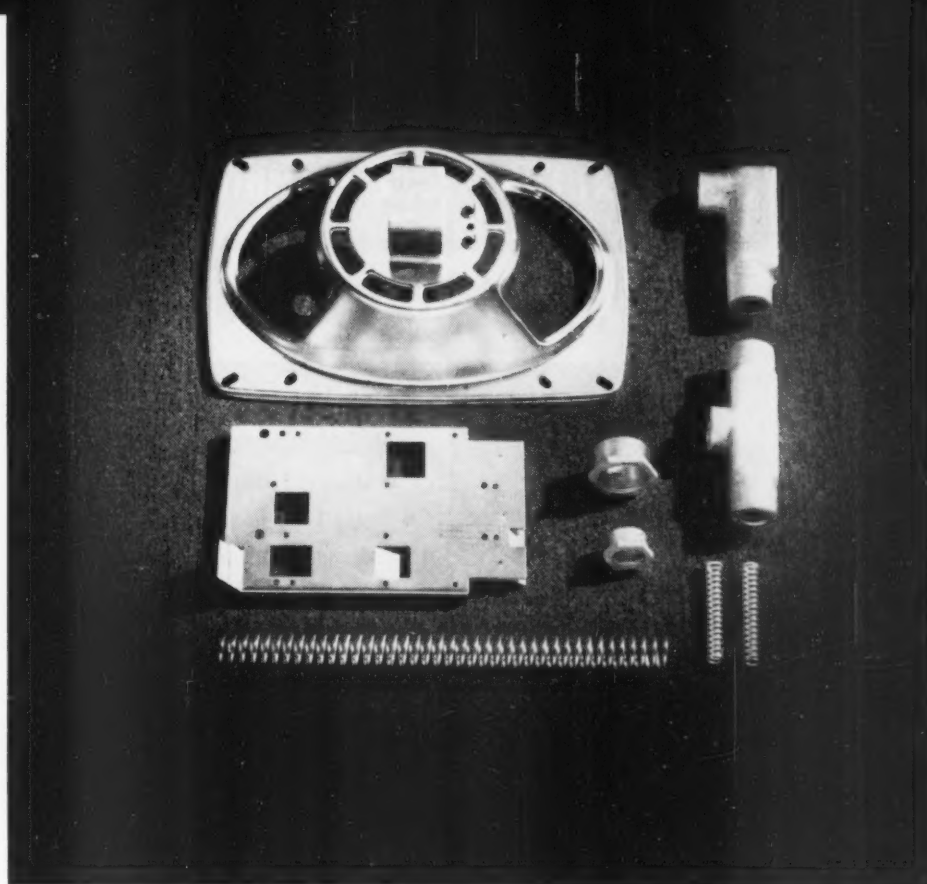
To Electroplaters who have not used Forged-Copper Ball Anodes in their copper plating process, we urgently suggest they make this test for comparison purposes.

Udylite has many price conscious customers, who after trying forged ball anodes, will use no other type. They say the price differential is more than overcome by other advantages.

The Udylite Forged-Ball Anodes are made from virgin metal. They are 99% pure copper. Here are some of the reasons for their superiority in copper plating. They eliminate oxide inclusions and anode sludging which give a rough plating finish. Copper deposits are smoother because forged anodes corrode more smoothly and uniformly. There are fewer rejects and therefore the operating economy is greater. The extra smooth deposit assured by the use of Udylite Forged-Ball Anodes means easier buffing on all work.

Forged-Copper Ball Anodes by Udylite combine all the well-known advantages of the ball shape, *plus* fine uniform grain structure. They can be shipped immediately from stock at any of nine conveniently located warehouses.

ADVERTISEMENT



A FINER CADMIUM PLATING PROCESS by UDYLITE

Bry-Cad Process Gives a Faster and Brighter Cadmium Finish

Newly developed by Udylite research, Bry-Cad offers many interesting applications for cadmium plating.

Springs—Bry-Cad provides excellent protection with a minimum of hydrogen embrittlement.

Electronic Assemblies—Bry-Cad's low electrical contact resistance is highly desirable on assemblies put together with fasteners. An excellent surface for rapid soldering.

Malleable Iron Castings—Bry-Cad gives unusual coverage not obtainable with similar rustproofing finishes.

Stainless Steel Aircraft Parts—Bry-Cad does not cause embrittlement of stainless steel parts subjected to high temperature.

Udylite Bry-Cad has other advantages such as: High cathode efficiency, simplicity of operation and control, attractive finish with less tendency to finger mark, a self-lubricating metal and good resistance to mild alkalis. Bry-Cad is easily adapted to plating in barrels, hand operated tanks, semi-automatics or full automatic machines.

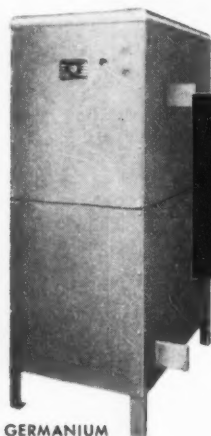
The Udylite Bry-Cad process is just one of the many electroplating processes pioneered by Udylite. Whether your need is for a process, equipment or supplies—be sure to consult your Udylite representative or fill out coupon and mail to us direct.

THE
Udylite
CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST
PLATING SUPPLIER

Reconsider the source of your D-C power

DOES IT **AUTOMATICALLY** MAINTAIN
CONSTANT VOLTAGE TO YOUR TANK?



GERMANIUM
OR SELENIUM
TYPES

THER REACTRON DOES!

DOES IT ALSO
GIVE YOU:

- Stepless Voltage Variation
- Single-knob fingertip control
- Small, remote operator's panel
- Static saturable reactor
- Advanced magnetic amplifier design
- Fast response and wide control range

THER REACTRON DOES!

AND AT LOWER OVERALL COST

Reduced Maintenance Cost:

THER REACTRON eliminates tap switches, vacuum tubes, motor driven brushes, arcing contacts, gears and other moving parts.

Write for technical study of
**REACTRON vs. TAP SWITCH or
MOTOR DRIVEN VARIABLE AUTO-
TRANSFORMER** installations.



It's **THER** . . . Whatever your D-C Requirement

THER ELECTRIC & MACHINE WORKS

ESTABLISHED 1915

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Plastic Lining Process

A. Gusmer, Inc., Dept. MF, Woodbridge, N. J.

Gusco plastic cladding process is intended for lining large tanks and the application is accomplished by a new heated spray gun, using liquid epoxy resin and hardener, separately proportioned to the gum, which internally mixes before atomization. Using heat to replace solvents, and by special formulation, coatings of 100% solids, averaging 15 mils per coat, can be applied to steel, concrete or wood at rates up to 500 sq. ft. per hour.

The spray gun weighs only 1 pound and operates with conventional trigger action. It is supplied with hot material, in proper proportion, from a compact

portable heating and automatic positive pumping machine, weighing 85 pounds and requiring 25 amperes at 115 volts A. C.

Precise mixing and proportioning, as necessary for perfect corrosion resistance, are continuously indicated to the applicator through the use of a three color system; the hardener and resin each being different in color, to produce a third color when mixed. The system has proven highly effective as it gives the applicator constant visual observation of the efficiency of the equipment and also allows supervisory personnel to observe perfection of operation at all times.

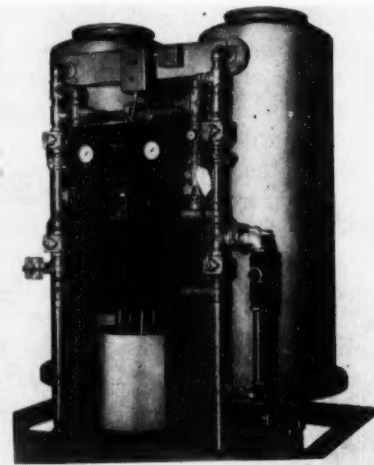
In addition to the physical advantage of the thick films made possible by the new process, exceptional chemical re-

sistance of the coating has been observed.

Application is now being made on a limited production basis. The company is expanding its facilities at the Woodbridge, N. J., location in order to handle the anticipated increasing volume of custom coating as well as preparing for field application to equipment too large to be transported to the plant.

Dual Column Demineralizer

Penfield Mfg. Co., Dept. MF, 19 High School Ave., Meriden, Conn.



A new industrial demineralizer, designated as Model ULA-2500, operates on dual column ion exchange principles (one column each of cation and anion resins) and features a fully automatic regeneration system, including rinsing and recutting in the effluent when desired pre-set standard of resistivity (purity) is reached. Capacity of the unit is 2,500 GPH of demineralized water with a purity of less than 2 PPM.

All operating functions are automatic. When the effluent's purity falls below the desired standard originally set by the operator, the unit automatically stops delivering treated water and the need for a regeneration cycle is signalled. The regeneration cycle is initiated by setting one switch and completes itself entirely automatically, including rinsing and recutting in the effluent when the pre-set standard of purity is attained.

The columns of the new unit are rolled steel, butt welded, with 100 per cent plastic lines. Underdrain system consists of perforated stainless steel plate on top of which a plastic screen rests. This system produces excellent distribution results and elimi-

nates the necessity of space-consuming distribution media.

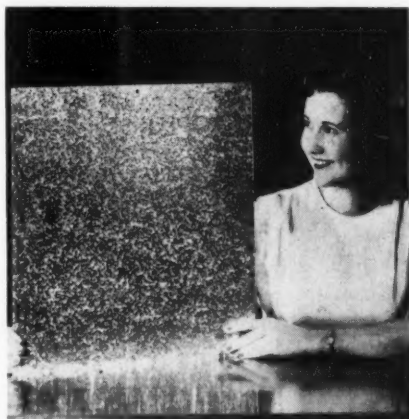
Regenerant piping includes non-corrosive eductors, non-corrosive valves, and plastic draw-up lines for both acid and caustic regenerants. Process piping is 150 lb. bronze pipe for all raw water lines, stainless steel or plastic on all effluent lines.

Spangle Finished Aluminum

Aluminum Company of America, Dept. MF, 1501 Alcoa Building, Pittsburgh 19, Pa.

Aluminum sheet, processed with this new unusual finish, presents a multitude of reflecting facets offering a continually changing surface pattern. Tentatively called "Spangle-Sheet," the new finish will have almost limitless possibilities in decorative applications. It has been applied in color and natural finish to plain and patterned rolled sheet, and extruded shapes.

The unique finish is based on inducing the formation of abnormally large grains in a special aluminum alloy. Individual grains are then made to stand out in relief by an acid etch. Action of the etch develops tiny mirror-like facets on each grain. Since, to the viewer, each grain is positioned differently than its neighbor, varying degrees of reflected light can be observed simultaneously over the sheet's surface.



The result is an aluminum sheet sparkling with highlights surrounded by islands of shimmering silver and contrasting patches of light and dark gray.

In one of the color anodized finishes, it shows at one time many pleasing shades of the color employed. Tones range from the very deep to the very light, with the color shade on the face of each grain changing as light plays across the sheet from various angles.

A product of the firm's research and

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USED IN SEMI OR FULL AUTOMATICS — BARREL OR RACK PLATING



IT'S A POWDER!

D-37 Chromate is a concentrated powder that you mix yourself. You don't pay freight on water.



NO LEACHING NECESSARY!

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COSTS PENNIES A GALLON!

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DISTRIBUTORS OF PROMAT'S GREAT LINE OF PROTECTIVE MATERIALS

Baker Dist., Cleveland; Crown Rheostat, Chicago; Haviland Co., Grand Rapids, Mich.; Loco Engineering & Sales, Los Angeles; LoSelCo., St. Louis; Munting & Munting, New York and Newark; The Reynolds Co., Philadelphia; F. H. Ross Co., Charlotte, N. C.; John Swift & Co., Canton, Conn.; Sundmark Co., Los Angeles; Gus Walgren Co., Grand Rapids, Mich.; Bill Young & Co., Cincinnati.

"PROMAT MEANS PROTECTIVE MATERIALS"

development laboratories, the new material is in the experimental stage and is not available commercially. The company plans, however, to intensify its development to utilize fully the promising potential of the new finish.

PVC Pipe with Uniform Pressure Rating

The Carpenter Steel Co., Alloy Tube Div., Dept. MF, Union, N. J.

A new line of light wall polyvinyl chloride pipe with a uniform pressure rating in all sizes, known as Schedule PR-150 series, represents an addition to the firm's recently announced Schedule 40 and Schedule 80 pipe. Its generally thinner wall and larger inside diameter give it greater flow capacity

than Schedule 40 and 80 in the same nominal pipe sizes.

There are two basic types in this new series. One has high chemical resistance and a maximum working pressure of 150 psi at 75°F. The other has high impact strength and a rating of 125 psi at the same temperature. These two working pressures are constant in all pipe sizes.

This pipe, a rigid unplasticized material, is available in eight sizes ranging from 1/2" to 4". Wall thicknesses range between .050" and .230". All pipe in the series is furnished in standard 10 and 20 foot lengths with plain ends.

A full line of socket solvent cement fittings is available for use with this

machines • materials • methods

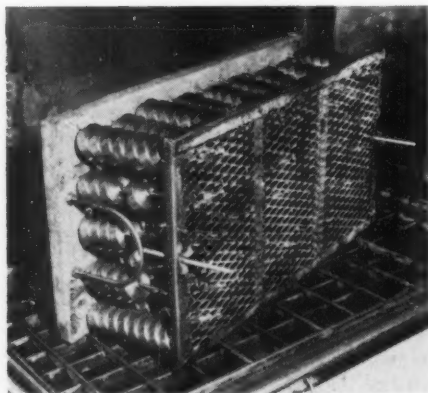


"Departmentalized" Cleaning Simplifies Production of Thousands of Small Parts

A major midwest business machine manufacturer has, during the past two years, installed 13 Magnus Aja-Lif Cleaning Machines in its production lines. Before installing these units "it was necessary to truck the parts to be cleaned a long distance to the cleaning area."

Now, each production line has its own Aja-Lif cleaning set-up incorporated in it. Production bottlenecks and wasted time have been eliminated as the thousands of parts are cleaned in the same areas where they are stamped, machined, forged or otherwise processed.

Factory personnel like the use of Magnus Aja-Lif machines — they are simple to operate, require little or no maintenance and have practically eliminated rejects due to poor cleaning.



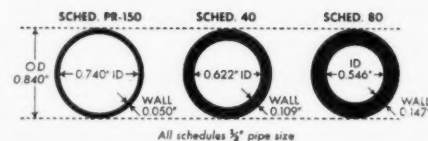
This is another example of how the increasing use of Magnus Methods, Machines and Materials is resulting in more efficient metal cleaning wherever used.

For additional information write to Magnus, 11 South Avenue, Garwood, N. J. for your copy of 36-page Manual 10,000G.



**INDUSTRIAL DIVISION
MAGNUS CHEMICAL CO., INC.**

— a world-wide organization specializing in the protection and cleaning of all surfaces.



Three end views of 1/2" PVC pipe showing comparative wall thickness and flow capacity of new Carpenter Schedule PR-150, Schedule 40 and Schedule 80 pipe.

new pipe. Threaded joints are not suitable with this line.

Both types of pipe in this series offer outstanding resistance to a broad group of corrosives. The pipe with the higher chemical resistance, known as PVC No. 1, is dark gray in color. The high impact grade, known as PVC No. 2, is light gray.

On an installed cost basis, Schedule PR-150 compares favorably with conventional threaded piping systems in iron pipe or galvanized. It also offers numerous advantages which can result in the reduction of maintenance and operating costs. This thin-wall pipe is easily fabricated on standard metal and wood-working equipment. It can be formed, sawed, machined, hot gas welded and solvent cemented. Installation is easy and inexpensive.

Roof Ventilator

*Chicago Blower Corp., Dept. MF,
9863 Pacific Ave., Franklin Park, Ill.*

A new, high-velocity industrial roof ventilator features automatic damper blades. The aluminum damper blades pivot on maintenance-free bearings across the diameter of the fan to open wide with minimum fan pressure. When operating, the exhaust velocity keeps out rain, snow, and exhaust re-entry. The ventilator is completely weather tight in the closed position.

Specially engineered airfoil shaped fan blades provide maximum thrust at lowest RPM's. Combined with the smooth galvanized steel damper head, the fan is able to discharge fumes and smoke high into the air. Although in-



creased discharge power is generated, the easily installed fan operates on less electrical output because of high efficiency and lower RPM's.

The fan can be equipped with a fire safety device, a safety-vent fusible link which melts when subjected to intense heat, releasing the dampers. For one story buildings with automatic sprinkler systems the fusible link attachment is called a necessity. Ordinarily fumes and smoke are trapped close to the floor impeding entry of fire fighters, but the high velocity fan automatically exhausts such areas rapidly. Blade diameters on the fans range from 24 to 60 inches with exhaust capacities of 6,640 to 53,700 cubic feet per minute.

Temperature Control

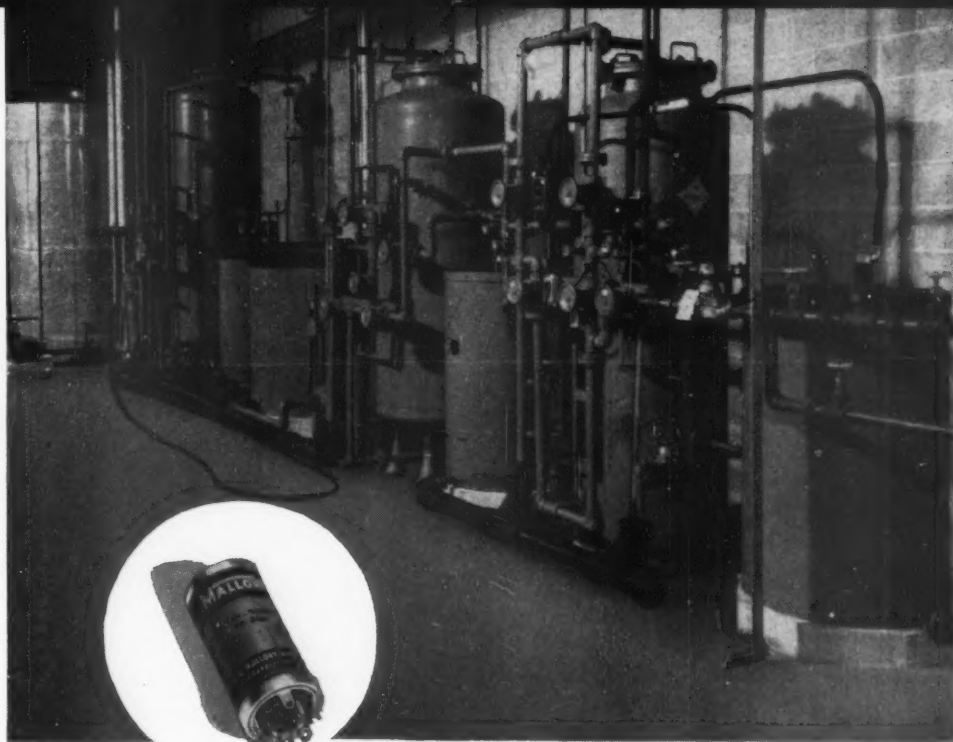
Tipp Mfg. Co., Dept. MF, Tipp City, Ohio.



Automatic monitoring and accurate control of temperatures from minus 200 degrees to 3,000 degrees Fahr., in a broad variety of industrial and research applications, are provided by the Tipp-Tron controller. Depending on the model, the device either prevents temperatures of equipment and processes from rising (high limit) or falling (low limit) past preset points. Double limit units also are available to maintain temperatures within specific and easily adjustable ranges. Control accuracy is held within 2 per cent of dial settings.

The unit is supplied in 10 ranges of temperature, with the shorter ranges offering more precise control. Calibration of the indicating meter is in both Fahrenheit and Centigrade.

Either on-and-off or locking control action may be selected by a switch. With on-off, the device initiates its desired control action when the temperature reaches the preset limit but it continues to test the temperature periodically. If the heat reaches a permissible level, the unit stops its control



How Industrial Demineralizer takes the "die" out of dielectric!

- **Mallory capacitors are processed with pure water for long life at peak performance.**

Water chemistry is important in making Mallory capacitors for radio, TV, military communications and other electronic uses. A necessary component in this wide field, they utilize either fabricated plate or etched foil for anode material.

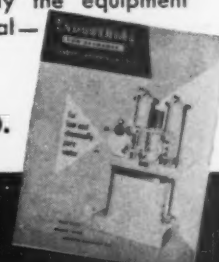
The process of etching aluminum foil requires the use of caustic salt and acid. The elimination of these chemicals requires final washing with extremely pure water. In addition, the various electrolytes compounded for these capacitors must also **use pure water to maintain the quality** necessary for the exceptional performance identified with Mallory products.

Mallory engineers specified this Industrial demineralizer to provide water of multi-distilled quality for all processing requirements.

This is the sixth Industrial unit bought by Mallory . . . concrete evidence that progressive companies **never take water for granted**. Its ability to carry chemicals can seriously affect product quality. Pure water costs little—an Industrial unit always pays for itself, usually in a few months, by reducing rejects and corrective labor.

Industrial builds complete water treating plants and waste treatment systems, maintaining a large, diversified engineering staff to make thorough process analyses and design exactly the equipment needed. If you use water for any process, write Industrial—a brief outline will bring you recommendations and estimates of costs and savings.

WRITE FOR BULLETIN 200.



Industrial

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Our best "door-opener" and "contract-closer" is the product itself. On its merits it has built us a "blue chip" customer list.

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BETTER FINISHES & COATINGS, INC.

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of auxiliary equipment while still indicating temperature. With locking control, the device must be reset manually each time the temperature reaches the control point.

To insure safety of gas ovens if power fails, the controller can be furnished with a circuit that prevents the solenoid gas valve from being turned on when power is restored.

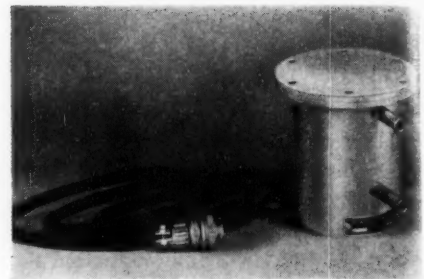
The standard unit is available in either single or multimeter models, with the latter providing control for virtually any number of individual temperature control points. Custom models also will be engineered and built to meet special heat control problems.

Magnetostriction Transducer

Acoustica Associates, Inc., Dept. MF, Glenwood Landing, L. I., N. Y.

A high-power magnetostriction type transducer, Model AM-203B, for large scale ultrasonic cleaning, degreasing, descaling, plating and other metalworking and finishing operations is now available to industry. The transducer is used with mating stainless steel jar or is externally mounted on a tank or trough. Only the Teflon face, which is impervious to solvents, most strong acids and alkalis, and other corrosive solutions is in contact with solution.

Average rf power applied to the transducer is 66 watts/sq.in. of radiating area. This tremendous power pro-



duces cavitation effects throughout a large volume of solution, the useful irradiated volume depending on solution viscosity and temperature, as well as desired rate of production. Special fittings may be mounted on the transducer for machine and point soldering applications. The transducer, measuring 4 3/8" Dia. x 4 5/8" H., is built to highest quality specifications. Frequency matching and stability are excellent and proper water cooling eliminates the annoying drift in frequency and loss in output associated with inadequately cooled units depending upon air cooling only.

The transducer stack is protected against the effects of the solution in contact by a Teflon "window" which is bonded to the stack by a novel, epoxy-type cement. Nothing is brazed or soldered to the stack to reduce efficiency by short-circuiting laminations and thereby raising eddy current losses. This most important technical feature assures highest conversion efficiency which approximates 70%.

This 400 watt, 25.9 kilocycle transducer can be grouped externally on existing process equipment and driven in tandem by matching above-audible frequency generators ranging in power from 400 to 10,000 watts and above. It can be used with liquids at temperatures far above boiling point, thus overcoming limitations inherent to barium titanate transducers.

Further information may be obtained by writing directly to the manufacturer.

OBITUARIES

WILLIAM J. PALMER

William J. Palmer, sixty-six, vice-president in charge of manufacturing, Phelps Dodge Copper Products Corp., died suddenly on Aug. 30. Widely known throughout the metals industry,

he joined the company in 1937 and was shortly thereafter named works manager of the Bayway Division, Elizabeth, N. J. He was named vice-president in 1952. Formerly, he was production manager for the Rome, N. Y., division of Revere Copper and Brass, and had been affiliated with Chase Brass and Copper Co., Waterbury, Conn., and Bridgeport Brass Co., Bridgeport, Conn. He had spent his entire business career in the copper and brass industry. At the age of 14 he worked at the Rome, N. Y., shops of Rome Brass and Copper Co. He interrupted his career to serve with the United States Army during World War I.

Mr. Palmer was a member of the Wire Association, American Society for Metals, British Institute of Metals, American Ordnance Association, American Institute of Management and the American Tariff League.

He was born in Rome, N. Y., Sept. 26, 1890.

He is survived by his wife, Gladys Marsh Palmer and two sons, William Thomas, 20, and John Michael, 17.

A. J. BOYER

Arthur J. Boyer, a Philadelphia sales representative since 1944 for E. F. Houghton & Co., oil, chemical and packing manufacturer, died suddenly at his home at 215 W. Tulpehocken St. on Monday, August 20th, after an illness of several months. He was 67 years old.

A veteran of both World Wars, Mr. Boyer held the rank of major in Army Ordnance. He was formerly a vice president in the investment firm of Lewis C. Dick Co., Philadelphia. He was graduated from Brown Preparatory School and attended Franklin and Marshall College and the Philadelphia Textile Institute.

Mr. Boyer was an active member of the American Society for Metals, The American Society of Lubrication Engineers, the Germantown Cricket Club and a past commander of the Ocean City Yacht Club.

He is survived by his wife, Pauline M.; two daughters, Mrs. George K. Reynolds, Jr., of Lancaster, Pa., and Mrs. Ernest E. Hedler, Jr., of Hudson, Ohio; a sister, Mrs. Walter Torpey of Philadelphia, and three grandsons.

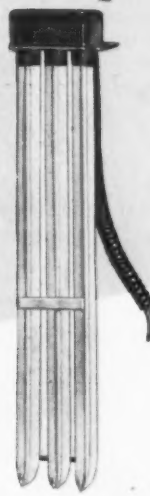
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TYPE "U"
PATENT PENDING
World's first successful U-tube
ACID Heater
—Guaranteed to outperform and outlast all other quartz heaters.



TYPE "GN"
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Standard straight tube Quartz
ACID Heater
—Vapor-proof junction box; replaceable heating element.



TYPE "MB"
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ALKALI Heater
—Portable, burn-out proof, easy mounting, long life.

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IMMERSION HEATER

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YOUR EVERY HEATING REQUIREMENT

All **3** Types

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- AVAILABLE IN ALL VOLTAGES—WATTAGES, one and three phase
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BUSINESS ITEMS

Enthone, Inc., Expands Marketing Program

Enthone, Inc., has announced a marketing program designed to increase its service to its customers in the New England—Middle Atlantic states area. In the first phase of this program, Derick S. Hartshorn, Jr., has been promoted from sales and service engineer to district manager of the New York City, Westchester and Long Island area. In his new capacity, Mr. Hartshorn will be in charge of all sales and



Derick S. Hartshorn, Jr.



the KLEM representative

— he's in your area to help you

The next time the KLEM man calls at your plant take advantage of his specialized experience and training in metal surface cleaning and preparation. If you have a problem he may be of help to you on the spot, if not he'll use the KLEM-PLAN to present the facts to our lab technicians who will find a quick answer for you.

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Peter Veit

service work and personnel in his area. He will also be available personally for service and consultation whenever customers in the area require it.

Peter Veit of Larchmont, N. Y., has been appointed sales and service engineer. In this capacity, he will sell to and service customers in the Manhattan and Bronx areas of metropolitan New York, working under the direction of Mr. Hartshorn.

Mr. Veit is a chemical engineering graduate of Brooklyn Polytechnic Institute and has had considerable experience in production, sales and technical service for metal finishing. He served for several years as technical service engineer on metal cleaning problems and more recently was em-

ployed in the Production Engineering Department of Grumman Aircraft Corporation and as sales engineer for Heil Equipment Co.

Mitwol Named Midwest Sales Manager for Sel-Rex



Sid Mitwol

Sid Mitwol has been named Midwestern sales manager for Sel-Rex rectifiers and filters, according to an announcement from the Bart-Messing Corp., Belleville, N. J. Having joined the company in 1948 as a sales engineer, Mitwol has progressed through positions of increasing administrative responsibility, and was Eastern sales manager prior to his current assignment.

Mitwol's headquarters will be the firm's Detroit office located at 18040 James Couzens Highway, where he will work under S. S. Wilson, vice-president in charge of Midwestern operations. His main responsibility will be to coordinate major equipment sales and to service company distributors in the area.

A graduate Electrical Engineer of C. C. N. Y.'s School of Technology, Mitwol was formerly associated with Federal Telephone and Radio Corp. and the Radio Receptor Corp.

Blakeslee Elects New President

Recent announcement has been made of the election of Gale Blakeslee to the presidency of G. S. Blakeslee & Co. Mr. Blakeslee's new appointment makes him responsible for the administration of both divisions of the company which is devoted to the manufacture and sales of commercial kitchen machines and industrial metal parts cleaning machines and degreasing machines.

Mr. Blakeslee succeeds *G. R. Blakeslee* who becomes chairman of the board. *M. B. Pickett* has been elected vice-president and heads the industrial division sales. *T. V. Tegger* has been made treasurer of the company. *John*



Gale Blakeslee

Chat, general works manager, continues on as secretary.

Schaffner Mfg. Breaks Ground for Another New Building

Schaffner Mfg. Co., Inc., Schaffner Center, Elmsworth, Pittsburgh 2, Pa. broke ground Aug. 21 for additional 15,000 sq. ft. production space to manufacture their new buffs.

The new building will make the third building addition in the past year and a half for the company, which produces a full line of buffs, polishing wheels and buffing compositions.

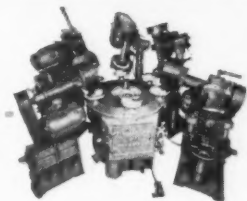
Lasalco Named Regional Distributor for Diamond CPA 1800

Lasalco, Inc., St. Louis manufacturer of electroplating equipment, has been appointed regional distributor for Diamond CPA 1800, a chromium plating additive developed by the *Chromium Chemicals Division* of the *Diamond Alkali Co.*

Circo Forms Washer Equipment Subsidiary

The formation of *Circo Cleaning & Finishing Equip. Corp.* as a wholly owned subsidiary of *Circo Equipment Co.*, Rahway, N. J., was announced recently. The new firm was created to fill the growing need for metal parts washers, power spray washers, dryers, ovens and complete finishing systems.

The new firm will design and construct custom-planned installations of



Hammond Automatic Deburring Machines will increase production, assure a uniform finish, reduce operator fatigue and save floor space.

Send sample parts for complete engineering report.

Hammond Machinery Builders INC.

1601 DOUGLAS AVE.

KALAMAZOO, MICH.

all sizes, from the smallest conventional parts washers to multi-unit, fully automated systems which have integral washers, dryers and paint units.

Officers of the new company are: *Melville Morris*, president; *Jerome Scherzer*, vice president; *Stanford Barlett*, manager; and *Henry Stanly*, chief engineer. Administrative engineering and production facilities are located at 51 Terminal Avenue, Clark (Rahway), N. J.

Harshaw Expands Manufacturing Operations Overseas

Harshaw Chemical Co. of Cleveland, Ohio has established a wholly-owned English subsidiary, *Harshaw Chemicals Ltd.*, with offices, manufacturing plant



A. C. Benning

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Technic solutions, like Technic advisory service, set the standards for precious metal electroplating.

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S. E. Pross

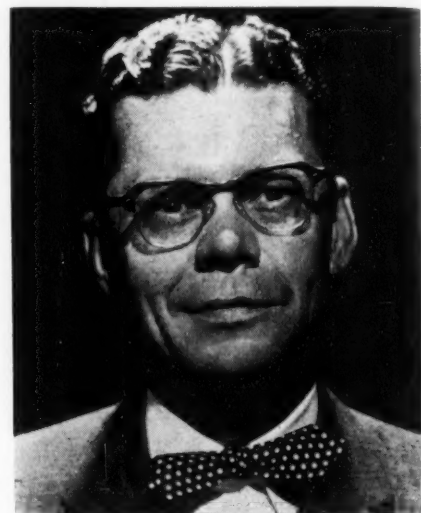
and laboratories at Waltham Cross, London, Eng. The new unit was formed primarily to supply electroplating chemicals and processes for the British Isles. Other chemicals manufactured by the parent company are expected to be added as markets are developed.

A. C. Benning, long active in the manufacture, sale and service of electroplating chemicals at the home office is manager of the new unit. S. E. Pross, Hounslow, has been made assistant general manager. Among Mr. Pross' former connections was a tour of duty for the Kuwait Oil Co. in the Persian Gulf area.

Harshaw electroplating chemicals have been available in England through agents of L. van der Hoorn's Chem-

ische-Technische Industrie, N.V. who have been operating under license at Utrecht for several years. The new unit will supplant these imports and speed up service for the local customers. L. van der Hoorn's will continue to expand their operations in Continental Europe.

Claude Weekly Joins MacDermid, Inc.



Claude E. Weekly

To expand new product service facilities, MacDermid, Inc., Waterbury, Conn., recently appointed Claude E. Weekly to the newly created post of product service engineer. He will devote full time to product testing and development in the field and brings to the company more than twenty years of metal cleaning, plating and finishing experience as foreman, supervisor of finishing rooms, metal finishing consultant and service manager. His most recent position with Promat Division of Poor & Co. He is a charter member and past-president of the Indianapolis Branch, A.E.S.

Edson Joins International Nickel

Alden P. Edson has joined the staff of the New England Technical Field Section of the International Nickel Co.'s Development and Research Division.

Formerly associated with the company as a metallurgist at the research laboratory at Bayonne, N. J., Mr. Edson from 1943 until this year was with Hamilton Standard Division of United Aircraft Corp., at Windsor Locks, Conn. Starting as a senior metallurgist, he served subsequently as assistant chief metallurgist, chief metallurgist and chief materials engineer.

He is a graduate of the University of Kansas and holds the degree of Bachelor of Science in Chemical Engineering.

H-VW-M Retires Baldwin; Names McMullen to Flux Sales Post

Hanson-Van Winkle-Munning Co. has announced the retirement of Allen T. Baldwin, manager of the company's flux sales department. His retirement was effective June 30, 1956.

At the same time the firm announced



Allen T. Baldwin

the appointment of Warren H. McMullen as metallurgist in charge of development, technical field and sales work in the company's flux programs. Mr. McMullen will carry on this work within the sales department but under the general direction of Myron B. Diggin, vice president.

A veteran of 24 years with the company, Mr. Baldwin is a leading authority in the fields of hot galvanizing and tinning techniques. His career at H-VW-M was devoted to developing new methods and techniques in these fields, with special emphasis on the development and use of flux.

Mr. Baldwin's contributions to the industry have been considerable. Many of the papers he prepared and presented to such groups as the Galvanizers' Committee of the A. E. S. and A. S. M. are used as texts on the subject.

He will continue with the firm as a flux consultant, in which capacity he will serve regularly in the development, servicing and promotion of the company's flux program. In addition, Mr. Baldwin will continue to look after the affairs of his newly established

SURROUNDING IT ISN'T ENOUGH

Just hanging soiled metal parts in a tank of soak cleaner won't necessarily get them clean. You've got to be sure that the cleaner gets into the soil.

You can be sure with . . .

Cowles NS SOAK CLEANER

Cowles NS Soak Cleaner penetrates deep into crevices and recesses to wet-out crusty soil deposits. Emulsifies oil and grease. Disperses drawing, stamping and buffing compounds.

No scum on the cleaning tank to foul cleaned metal coming out. Clean it with Cowles NS Soak Cleaner and it stays clean.

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Cleveland 3, Ohio

Please send Cowles NS Bulletin

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Company _____

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City _____ State _____

Cowles

CHEMICAL COMPANY

Cleveland 3, Ohio

See Cowles' other advertisements on pages 84 and 93.

Baldwin-Gregory Co., Inc., a firm of consulting engineers which will act in an advisory capacity in the installation of equipment and product engineering in the galvanizing and tinning fields.

Warren H. McMullen graduated from Rensselaer Polytechnic Institute with a BS degree. He then spent several years in the laboratory of a large appliance plant.

He joined H-VW-M in 1953, working in the company's laboratory on the metallurgy of all the company's processes. In 1955 he began specializing in flux processes, studying these in the company's laboratories and as a part of visits to customers' plants.

With this experience in the galvaniz-



Warren H. McMullen

ing and tinning fields, he brings to his new post valuable knowledge and experience to continue the technical development, customer service and sale of fluxes.

Schillmoller Joins Inco's West Coast Field Section

Charles M. Schillmoller has joined the staff of the West Coast Technical Field Section of the *International Nickel Co.*'s Development and Research Division.

Mr. Schillmoller received his early education in Holland and the Netherlands East Indies; served with the Netherlands' Air Force during World War II, and completed his education at Australia's University of Sydney, where he received a Bachelor of Engineering Degree in 1952. While attending the University, he operated his own business, Schillmoller Products Co., manufacturers of heat-proof table mats. From August, 1952, until joining Inco, he served as a corrosion engineer with the Richfield Oil Corp., Los Angeles, Calif.

De Witt Rubber Completes Move to New Location



The *De Witt Rubber Manufacturing Co.*, specialists in lining and relining tanks, pipes, tumbling barrels and exhaust blowers, with corrosion resistant rubber, Koroseal and neoprene lin-

ings, announces that its complete operations are now carried on in its new plant at Fairfield and Plog Roads, Caldwell Township, N. J. Phone PRescott 7-4628.

Rex Promoted by Diamond Alkali Co.

Appointment of David J. Rex to the newly-created post of process engineer

for the Silicate, Detergent, Calcium Division has been announced by *Diamond Alkali Co.*, Cleveland, Ohio.

A chemical engineer at the Paines-

BEAM-KNODEL CO.

Metropolitan Distributors
HANSON-VAN WINKLE-MUNNING CO.



Complete Service for Metal Finishing

Products Listed Below Available in New York
Stock With Reasonable Exceptions

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Anodes, All Kinds
Brushes
Buffs
Chemicals
Tripoli Comp.
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Tallow
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Glue

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PRODUCTS

HOW THIS MAN LICKED HIS HIGH PIPE COIL COSTS



Very easy. He did away with all of his pipe coils and in their place installed the

DEAN THERMO-PANEL COIL

Notice how easy it is to lift the Dean Thermo-Panel Coil for installation or for removal when you want to clean the tank or the coil. You can't do that with an old-fashioned large, heavy, expensive, inefficient pipe coil. Also, much time is saved. You can hang and remove the Dean Thermo-Panel Coil inside the tank, as shown above, in a jiffy. The space saving, too, is important. Sometimes 50%.

For those engaged in plating, degreasing, metal washing, etc., we suggest a study of our 52-page Technical Data Bulletin No. 355 which tells about the numerous applications of this remarkable device for heating or cooling via steam, water, etc. And Bulletin 256 gives prices and shows how you can do your own estimating. We will send you either or both of these bulletins, and, if you wish, our engineers will help without obligation.

Backed by 20 years of Panel Coil Manufacturing.

DEAN THERMO-PANEL COIL DIVISION
DEAN PRODUCTS, INC. 613 Franklin Ave., BROOKLYN 38, N. Y.
Tel. STerling 9-5400



ville (Ohio) works for the past nine years, Rex already has taken over his new duties. He joined the organization in November, 1947, following five years in development and process engineering work with Hercules Powder Co. at Radford and Hopewell, Virginia and Lawrence, Kan.

Born in Pittsburgh, Pa., Rex attended Ingram and Crafton public schools there and graduated from Carnegie Institute of Technology in 1942, with a B. S. degree in chemical engineering. He is a Mason and a member of Theta Tau, honorary engineering fraternity; the American Institute of Chemical Engineers, and the Painesville Kiwanis Club.

Meaker Appoints Representative

The Meaker Co. of Chicago, Ill., announces that the Platers Supply Co., Inc., 2311 Valley Ave., Indianapolis 18, Ind., has been appointed sales representative for the firm's products in the state of Indiana and also the northern portion of the state of Kentucky.

Wyandotte Chemicals Adds Two to Service Staff

Bernard Kumko and John H. Sauntry have recently been added as Wyandotte Chemicals Corp. representatives. Kumko will headquarter in Grand Rapids; Sauntry in Chicago.

Mr. Kumko is a chemical graduate of University of Virginia, served four years in the U. S. Navy, eight years as an electroplating chemist and has several years previous sales-service experience with the Parker Rust Proof Co.

Mr. Sauntry is a chemical graduate of Fairfield University, Conn., and

SPEED UP PRODUCTION with DOUBLE-ACTION DRYING

Air-dry as you spin-dry with the new, improved New Holland Model 20 KREIDER CENTRIFUGAL DRYER

● Now you can *spin-dry* small parts in continuous *fresh air* in as little as 15 seconds.

Double-action drying with peak-efficiency evaporation gives smooth moisture-free surfaces . . . reduces your finishing problems by eliminating the scarring frequently responsible for costly "rejects."

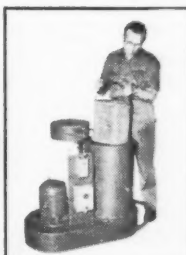
Your operators will be able to boost production, cut costs way down when you install New Holland's easy-to-run Model 20 Kreider Centrifugal Dryer.



SAFER because of Mechanical and Electrical Control Features!



To unlock cover and remove basket, operator must depress foot brake, stop spinner.



Machine cannot start with open cover. Ample clearance allowed for quick loading.



To start spinner, operator must first close cover completely.

SPECIFICATIONS:

1 h. p. motor—220, 440, 550 volts—2- or 3-phase—spins 75-lb. loads at 825 r.p.m. . . . Quiet V-belt drive . . . 30-blade suction turbine draws air through spinner . . . Arc-welded steel-plate construction . . . Heavy-gauge woven steel mesh basket . . . Weight: 490 lbs. . . . Floor space: Just under 5 sq. ft. . . . Meets N.E.C. specs. **Optional:** J.I.C. Control: Mounted on right, left side or wall. 160° supplementary heat: 2350-watt Chromalox, or steam.



Send for illustrated 4-page folder. Address Dept. M-106, New Holland Machine Company, New Holland, Pa.

NEW HOLLAND MACHINE COMPANY
NEW HOLLAND, PA.



Bernard Kumko



John H. Sauntry

has several years research and development experience with Reynolds Metals.

Both Messrs. Kumko and Sauntry have received several weeks of intensive training in product application at the firm's research and technical service laboratories and in selected industrial centers.

Dust Suppression and Engineering Moves

Dust Suppression and Engineering Co., builders of the Air Tumbler, wet type dust collector, have moved their office to 120 South Broadway, Lake Orion, Mich. The building houses the administration offices, engineering department, and testing laboratory.

The engineering staff has been

joined by *Elbridge M. Smith* who has had ten years experience in dust control work. He will function as assistant chief engineer.

Canadian Permag Adds New Building

Although their new plant in Montreal has been in operation only three years, the *Canadian Permag Products Ltd.* has started construction of a further extension.

While the new added space will be used mainly for manufacturing purposes, increased storage space is also needed for larger stocks of finished compounds to meet heavier demands. Extra land adjoining the present property has been purchased so that future extensions, as required, may be planned without restriction.

The new building, providing 50% more space, will be in operation before the end of the year.

The company manufactures a wide range of industrial cleaning compounds and solvents, and has been performing technical services to all types of manufacturing industries from coast to coast in Canada for twenty-four years.

Circo Completes Plant Expansion



Doubling of production and engineering facilities has been completed at the Rahway, N. J. plant of *Circo Equipment Co.*

The original plant, with 24,000 sq. ft. of space, was built only four years ago. A feature of the expanded plant

is its unique materials handling section which will allow for production and erection of all types of degreasers, washers and complete finishing systems. The engineering and business offices are now fully air-conditioned with a modern ventilating and heating system throughout.

Chromalloy Names Two Representatives

The appointment of two new field representatives has been announced by *Chromalloy Corp.*, White Plains, N. Y.

Frank S. Kleeman, 1112 Prospect Road, Pittsburgh, Pa., will represent the company in Western Pennsylvania and *H. Arch Mason*, 712 Ashland Ave., Buffalo, N. Y. will be the representative in Western New York.

Schultz Appointed Salesman for John B. Moore Corp.

Norman R. Schultz will handle the sales of *John B. Moore Corp.*'s complete line of cleaning solvents in the States of Washington and Oregon.

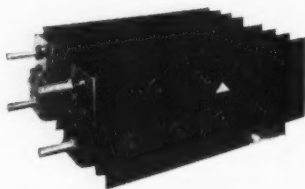
He graduated from Oregon State College with a Bachelor of Science Degree in Electrical Engineering and was elected to Sigma Tau, Eta Kappa Nu, Tau Beta Pi, Honorary Engineering Societies.



For the Finest in
**PLATING
RECTIFIERS**

**A BETTER SOURCE OF DC POWER —
MORE FOR YOUR MONEY**

- ★ Operate from —40° to 225° F.
 - ★ 50 to 50,000 Amperes DC
 - ★ Built-in Voltage Regulator and Meters
 - ★ Heavy Duty Transformers, Husky Fans
- Two styles available—1. Selenium for cool zones, or 2. Magnesium copper sulphide for the hot, dirty jobs. Units still running after 4 years of constant duty.



**Replacement Rectifier Stacks
for Lektron or Udylyte-Mallory**

Magnesium copper sulphide rectifiers make your plating power supply more rugged and dependable. Magnesium radiator fins for fast heat dissipation and lighter weight. Matching pairs.



Model 4045—750 amps at 12 volts DC—1500 amps at 6 volts D.C. Operates on 208, 220 or 440 A.C. Weight 525 lbs. F.O.B. Indianapolis, Indiana.

SOME JOBBERS AND SALES TERRITORIES OPEN

ELECTRONIC RECTIFIERS, INC.

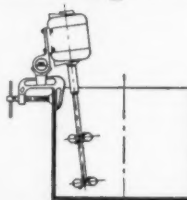
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INDIANAPOLIS 3, INDIANA



**This Portable
MIXER
Will Speed-up
YOUR**

Cleaning and Degreasing Operations



Mount Alsop Mixers to any tank or container—for any fluid mixing operations in your plant.

Here's a speedier, low-cost way to clean and degrease your work parts. An Alsop Mixer will do all the work—it will drive and dash the solvent through and around the parts—cleans them faster, and far more efficiently.

Sturdy, dependable Mixers for any size or shape, new or existing Tanks; for single or multiple installations. Alsop Portable Mixers are easily and quickly mounted. Sizes 1/4 to 7-1/2 H.P.

Write Today For ALSOP Mixer Catalogue

**ALSOP ENGINEERING
CORPORATION**

1110 Bright St., Milldale, Connecticut

Before joining the sales force, he served in the research and development program as electrical engineer at Boeing Aircraft in Seattle and has been a sales engineer with Shaffer & Nelson, Leach Corp. and Electronic Specialty Co. where he was assistant sales manager.

Young Presidents' Organization Elects Giesel

Robert L. Giesel has been elected treasurer of the Chicago Chapter, Young Presidents' Organization. The YPO is a national association whose membership is made up of more than one thousand young men and women who are presidents of their respective companies. Mr. Giesel heads Adolph Plating, Inc., 832 S. Central Ave., Chicago, Ill.

Rudan Joins O'Donohue Sales Co.

Mr. C. F. O'Donohue, president of O'Donohue Sales Co., Milwaukee, Wis., distributors of metal finishing chemicals and supplies, has announced the appointment of Stephan J. Rudan as district representative in Southern Wisconsin.

Mr. Rudan formerly was sales and



Stephan J. Rudan

service representative for Ekco Products Co. of Chicago, Ill., processing division. Mr. Rudan's new responsibilities will include the sales and service of metal cleaning and finishing installations to Wisconsin industrial plants.

R. G. Howser Joins Wyandotte Chemicals

Richard Glen Howser recently became a Wyandotte Chemicals Corp. in-



Richard Glen Howser

dustrial representative in Denver, Colo. He is a graduate of University of Tulsa and has twice served in the U. S. Army — first in the Air Corps and later as a battery officer and instructor — a total of over four years. Since 1953 he has traveled the Mountain states in industrial sales-service positions.

Before being assigned to his Denver headquarters, Mr. Howser was given intensive product application schooling

TAKE IT OFF!!

WITH PHOENIX COLD STRIPPER

Used Cold. Non-flammable.

Non-injurious.

For speedy removal of tough industrial paints, enamels, synthetics, lacquers, varnishes, wrinkles, dye markings, graphite, metal lithography, epoxies, and enamel wire stripping.

- Apply by DIP — SPRAY — or BRUSH.
- WATER FLUSH — or RAG WIPE.
- REFINISH.

PHOENIX COLD STRIPPER

- ★ Will not affect precision parts of ferrous and non-ferrous metals, wood or glass.
- ★ Non-corrosive, Non-evaporating, Non-toxic.
- ★ Does not lose strength through usage. Just add new stripper to replace drag-out.

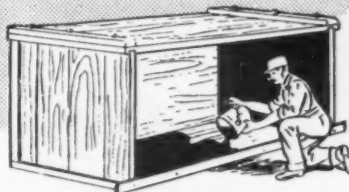
Salvage Expensive Rejects At Low Cost!

Write for SAMPLES and QUOTATIONS,
or ORDER 5 GALLON AT DRUM PRICE.

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Easy to Apply RUBBERITE TANK LINING



**Just heat
to 300° F.
and pour**

Provides a lasting lining that withstands acids and caustics at room temperatures. A standby of Platers for over 25 years. Effectively protects wood or steel tanks. Easily applied in your own shop—just turn tank on side and fasten board on edge as illustrated. Then heat Belke Rubberite to 300° F. and pour over surface. Surfaces to be coated require no special preparation but should be reasonably clean.

When Rubberite cools, it has characteristics similar to soft rubber. Will not crack, scale, or run in the hottest weather. Write for complete information.



MANUFACTURING CO.

947 North Cicero Ave.
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EVERYTHING FOR PLATING PLANTS

in the firm's research and technical service laboratories and received industrial field training in the aircraft, metal finishing and petroleum industries.

Doram Products Moves to Larger Quarters

Doram Products, Inc., recently located at 410 Frelinghuysen Ave. in Newark, N. J., has moved both factory and offices to a larger, more spacious location at 906 Lincoln Blvd. in Middlesex, N. J.

The corporation, making varnishes and coatings for vacuum evaporation and silver spraying has, by this move, been able to add a complete pilot plant under the name of *Irwin Industries* for the purpose of proving the various varnishes, coatings and metalizing processes for customers' products. One of the largest job platers in the country, the firm also supplies dyes, silver and reducer solution and other sundries for platers exclusively.

In addition, the company offers a personalized service of fabricating and installing complete plating plants and servicing them with dependable supplies and competent engineers.

Stevens Adds to Laboratory

Several new additions to the *Fred-eric B. Stevens, Inc.*, Customer Service Laboratory facilities have just been completed. Lab facilities for metal finishing product research, development and customer service work now total 6000 sq. ft. plus office facilities. The two most recent additions added a total of 360 and 2050 sq. ft. to the facilities.

The larger addition includes a simulated automatic barrel line capable of reproducing any barrel plating or processing cycle, including all phases of cleaning. Also included is a standard horizontal plating barrel set-up that permits comparison of maximum controlled effective plating loads for both manual and automatic operations. Four storage tanks and two 2,000 amp. 24 volt rectifiers are also part of the installation. A new cyanide package waste disposal plant has also been added to the above laboratory facilities and is used for experimental work in that important area.

This facility is operated under the direction of *Leonard Singer* and *Victor Matosh*.

The second addition to the labora-

tory consists of a complete buffing composition cleaning set-up. This facility is under the supervision of *Dr. LeRoy High*.

Bristol Appoints New Chicago, St. Louis Managers

The appointment of *S. E. Gewin* as district manager of the Chicago office was announced recently by *The Bristol Co.* of Waterbury, Conn.

Mr. Gewin's successor as manager of the St. Louis office will be *Walter Messner*.

Mr. Gewin has been with the company's sales organization since 1937, when he became a field engineer in the Philadelphia office. He later served in the Charleston, Pittsburgh, and Buffalo offices, before being promoted to district manager of the St. Louis office in 1953. He is a graduate of the University of Alabama.

Mr. Messner has been regional field engineer in Tulsa, Okla. since 1943. He joined the sales force in 1940 in the New York office, after receiving his B.S. degree in Chemical Engineering from Brooklyn Polytechnic Institute.

The Chicago offices are located at 351 E. Ohio St.; the St. Louis offices at 434 Cotton Belt Bldg.

McKeon's

Zinc-Brite

TRADE MARK REG'D

Top-quality, low-cost

ZINC SOLUTION

PURIFIER

Eliminates heavy metal impurities, including copper.
Prevents harmful build-up of carbonates.

A complete cleansing treatment: — No other purification measures necessary.

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Sulphur Products Co. Inc.

228 McKeon Way

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For ALL Your

Metal Finishing Needs

Depend on DAVIES

The Southwest's Leading Supplier of

Industrial Plating and Polishing

- COATINGS
- PLATING RACKS
- EQUIPMENT
- CHEMICALS
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4160 Meramec St. • MOhawk 4-9332 • ST. LOUIS 16

301 N. Market St. • PROspect 5423 • Dallas 1

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Pfizer Announces Four Assignments in Chemical Sales Division

The Chemical Sales Division of *Chas. Pfizer & Co., Inc.* has announced four personnel changes in its Brooklyn headquarters organization and its field sales force.

Edward W. Marlier, formerly sales representative in the Pittsburgh and Cleveland areas, has been assigned to the headquarters staff of the Industrial Chemicals Department in Brooklyn. Mr. Marlier joined the company in 1951 as a production supervisor in the Brooklyn plant, after serving with American Cyanamid Co. as a project engineer. He received a B.S. in Chemical Engineering from the University of Pittsburgh, and is a member of the Institute of Food Technologists.

Carl W. Lorentzen, who joined the firm in 1953 as a chemical sales representative, has been assigned to serve customers in the Pittsburgh and Cleveland areas. Prior to 1953, Mr. Lorentzen was with the Valspar Corp. as a chemist and assistant to the production manager. Mr. Lorentzen is a graduate of Adelphi College, where he com-

pleted pre-medical studies with a B. A. degree.

Walter Gropler has been assigned to serve customers in the Metropolitan New York area, and *Simon Sluis* will serve as a representative in the Pacific Northwest area.

Reynolds Joins Stokes Vacuum Equipment Sales Staff

J. Paul Reynolds has been appointed to the headquarters sales staff of the Vacuum Processing Equipment Division of *F. J. Stokes Corp.*, Philadelphia, Pa., as a product specialist in charge of vacuum furnace sales and product development.

A native Philadelphian, Reynolds received his B. S. in Mechanical Engineering from Drexel Institute in 1943 after three years' Navy service in the Pacific aboard a patrol craft during World War II. After graduation, he returned for a year to The Atlantic Refining Co., where his engineering career had begun in 1937, as a member of the oil company's production staff. Then for three years he worked on process equipment development for the International Latex Corp., in Dover, Delaware, and for a year on the

Philadelphia sales staff of Kinney Mfg. Co., leaving there in 1953 to go with Consolidated Vacuum Corp. as Middle Atlantic field manager.

Mr. Reynolds is a member of Tau Beta Pi, the A.S.M.E., and the A.S.M.

American Plating, Inc. Installs New Equipment

To speed zinc and cadmium electroplating processes for industries in the Tri-State area, *American Plating, Inc.*, has installed new automatic equipment at their plant in Zelienople, Pa. New automatic air operated hoppers and hot air drying equipment give the firm an automatic barrel-line for fast and efficient bulk plating of such parts as nuts, screws, bolts, plugs and small stampings.

International Rustproof Opens New Cleveland Plant

International Rustproof Corp. of Cleveland, Ohio has moved to a new and larger location in the heart of Cleveland's industrial area. This new location comprises a four-story building which will house modern research and development laboratories, as well as the entire manufacturing plant for

TAKE THE **LOAD**
OFF YOUR **TOP**
BRASS



USE **TRUE BRITE**
BRASS SOLUTIONS

Trouble Free — Low Cost
Little Supervision Needed
Ready To Use — Just Add Water
Uniform Color — Can Match Colors
Write For Bulletin on Brass Plating

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Industry's Abrasive

BONDING CEMENT
for Wheels and Belts

SIZES AS WELL AS BONDS

Gripmaster cuts out one preparation material and one preparation step. No special sizing is necessary. This superior bonding cement has a double use. But seein' is believin'. Test Gripmaster in your own plant under your own working conditions. Send us the enclosed coupon or use your company stationery and we'll send you a test size sample without charge or obligation.

LEA-MICHIGAN, INC.

14066 Stansbury Ave., Detroit 27, Michigan
(A member of the well-known Lea Group of Finishing Specialists)



Lea-Michigan, Inc.
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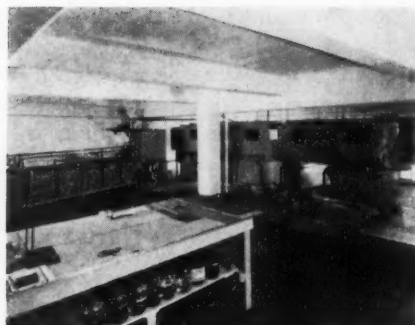
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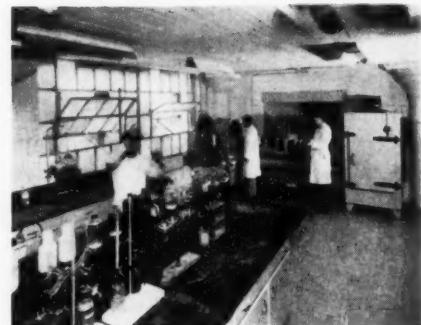
MF-4-56



New four-story building.



General view of new pilot laboratory.



Section of research and development lab.

the production of rust preventatives and corrosion solvents.

The new location at 1575 Merwin Ave. will be open officially September first. All general and executive offices, air-conditioned throughout, will be located at this address. A new pilot plant laboratory has been installed, complete

with conveyORIZED spray washers, dip tanks, and barrel units which will duplicate actual field conditions. The new development laboratory, equipped with the latest machinery and production facilities, is designed with adequate space for expansion. All labora-

tory research operations are under the direction of L. D. Barrett.

The new plant will be open for inspection to visitors attending the National Metal Congress in October. It is close to the Public Auditorium, and will be easily accessible for out-of-town guests.

J. S. Pettibone Joins Inco's Research Laboratory

John S. Pettibone has joined the staff of the Bayonne research laboratory of The International Nickel Co., Inc., as a member of the Corrosion Section. He will be associated with the section both as a technical writer and as a research chemist.

Prior to joining the company, Mr. Pettibone for seven years served as an assistant technical secretary with the American Society for Testing Materials. Previously, following brief periods as metallographer for Riverside Metal Co. and in the Research and Development Department of the Atlantic Refining Co., his experience

was in the field of product supervision with various companies.

He majored in chemical engineering at Lehigh University with subsequent work in Temple University and University of Tennessee extension schools.

He is immediate past chairman of the Philadelphia Section of the National Association of Corrosion Engineers.

FILTER with a Sethco

**New, Exclusive Self-Priming
FILTER PUMP**

300 GALS. PER HOUR



Model
LSIN-20
portable,
65 lbs.
14" x 16"
x 24" high

SERVICE — Filters any acid or alkaline plating solution from pH 0 to pH 14. Removes particles down to 1 micron.

DESIGN: Filter Assembly as illustrated in H.T. Lucite (also available in Stainless Steel 316, Hareg, Epoxy Resin, Rigid Vinyl, Saran, Polyethylene, Teflon). Filter tubes of cotton, dnyel, porous stone or porous carbon. **PUMP:** Self-priming, Stainless Steel 316 (also available in an all plastic construction). Available as Centrifugal in Stainless Steel or Hasteloy. Motor is 1/4 H.P., totally enclosed Ball Bearing.

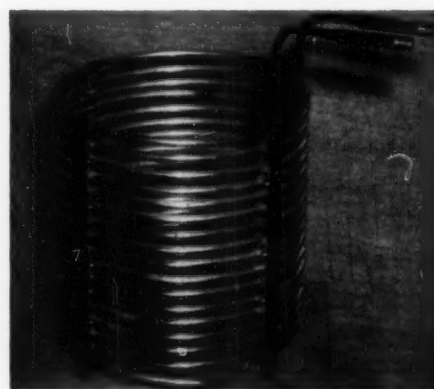
HOSE: acid and alkaline resistant. Base Platform: linen-impregnated phenolic laminate on rubber tire, ball bearing casters.

25 Stock Models to fit your needs. 50 to 2,400 gal./hr. cap. Others to your specifications.

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Sethco Mfg. Co.

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INCORPORATED

38 Stone Street
MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

Geregach and Sterbenz Join Goodrich

Michael J. Geregach and Robert F. T. Sterbenz have joined the staff of The B. F. Goodrich Company Research Center, Brecksville, Ohio, as junior technical men.

Born in Pittsburgh, Pa., Mr. Geregach attended Pennsylvania State University and the University of Pittsburgh and received the B.S. degree in chemistry from the latter school in 1953. He previously worked as a junior engineer with the Koppers Company.

Born in Cleveland, Mr. Sterbenz attended Collinwood High School and was graduated from Case Institute of Technology in 1956 with a B.S. degree in chemical engineering. He is a member of Alpha Chi Sigma, professional fraternity, and Zeta Psi social fraternity.

Arthur T. Schooley, Akron, Ohio, has been appointed to the staff as a technical man. Schooley joined the firm in 1954 as a materials engineer in the general chemical laboratory and later was transferred to the statistical quality control group before receiving his Brecksville appointment.

Born in Plymouth, Pa., Schooley received his B.S. degree in chemical engineering in 1954 from Carnegie Institute of Technology. He is a member of the American Institute of Chemical Engineers.

Metalwash Machinery Appoints Two

Metalwash Machinery Corp., of Elizabeth, N. J. announces the appointment of two new representatives in the

Degreaser Division for degreasers, degreasing finishing systems, perchloroethylene driers, and degreasing solvents.

Howard F. Brennan, formerly a representative for Loftus Engineering Corp., will represent the firm's line in Northern New Jersey, and J. W. Harvey, formerly sales manager for a mid-west portable hydraulic tool firm will cover the Chicago area.



Howard F. Brennan



J. W. Harvey

Prompt Delivery NICKEL ANODES

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NICKEL CHLORIDE COPPER CYANIDE

All Plating Chemicals

Automatic Plating & Polishing Equipment

IRITOX CHEMICAL COMPANY

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Watkins 4-1977

- ★ **BUFFING NU SPRA GLU**
Liquid buffing compound
since 1945
- ★ **NUGLU**
Cold flexible glue
since 1937
- ★ **BRUSHING NUGLU**
Grain and Nuglu mixture
since 1941
- ★ **SPRAY BUFFING
EQUIPMENT**
Guns, pumps, and valves
since 1945

J. J. *Siefen* CO.

5643 LAUDERDALE • DETROIT 9, MICH.

British Supplier Opens New Plant

The increasing activities of the *Electro-Chemical Engineering Co., Ltd.* and the expansion of the company's business during the last few years have now made it essential that all activities should be operated from one factory. Previously, complete manufacture had been carried out at the EFCO works at Burton-on-Trent and by various sub-contractors, but the new factory at Sheerwater, Surrey, which was opened recently makes provision for the carrying out under one roof of engineering work, chemical mixing and packaging, and the laboratory analysis of process solutions. The engineering activities of the company comprise the assembly and mechanical testing of automatic plating machines; it is also planned to manufacture other products at present being sub-contracted. The chemical products which are mixed and packaged at the new factory, comprise the range of chemicals used in the various proprietary-finishing processes, while the routine analysis of customers' solutions can be carried out at regular in-

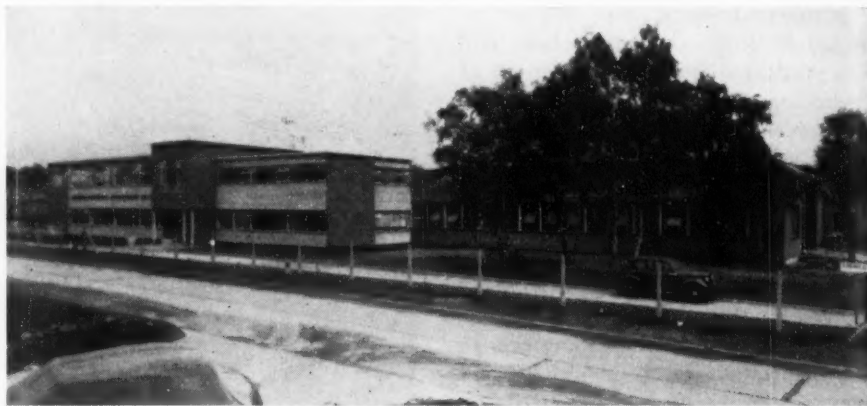
tervals as part of the free service given. In the development laboratory and demonstration plating shop new processes can be tried out and demonstrated.

The company was formed in 1939 as a wholly owned subsidiary of Electric Furnace Co., Ltd., now EFCO Ltd., and has previously been situated at Weybridge, Surrey. During the war its activities were concerned with the design and manufacture of automatic pickling machines for ordnance work, and after the war these activities were

extended into the production of general continuous pickling and electroplating plant.

Chairman of the company since its inception has been *D. F. Campbell*, also chairman of EFCO, Davy & United Engineering Co., Ltd., Metallurgical Equipment Export Co., Ltd., and Campbell, Gifford & Morton, Ltd.

From the time the company was formed and throughout the war years it was managed by *Dr. J. Kronsbein*, who left it in 1945 to take up an appointment in the U. S. A. He was suc-



View of office block.

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DIRECT FROM THE FACTORY

... by America's foremost importer and exclusive factory representative. Rigid quality controls assure you of a pure product—and the price is right, too!



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Speed Up Work

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HARRISON'S NEW



COMPOUNDS

Completely water soluble for steel
and all non-ferrous metals.

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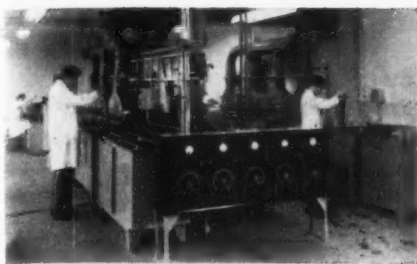
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Have Representative call.

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Demonstration plating shop.



Part of analytical laboratory.

ceeded by *Alan Smart* who, during the war years, had been responsible for supervising the installation of a very large number of automatic electroplating and pickling plants. He has been assisted by *J. H. Gifford* who joined the company in 1946 and has been specially interested in the planning and erection of the new works.

In 1946 *H. J. Bache* took over as

chief chemist and was responsible for building up the chemical laboratories and training his staff to install and service the new plating processes.

The company has recently been joined by *H. Silman*, who was previously research manager at the Ford Research Centre, Birmingham, and is a past-president of the *Institute of Metal Finishing*.

Ramey Promoted by Minnesota Mining

Promotion of *Joseph F. Ramey* to Boston branch automotive and industrial trades sales manager, coated abrasives division, has been announced by *Minnesota Mining & Mfg. Co.* Ramey succeeds *John H. Hargreaves*, who is retiring after 34 years of service with the firm.

Ramey joined 3M in 1948 in the company's St. Paul branch office. In 1949 he became a member of the coated abrasives sales force and was made the division's eastern region sales supervisor in 1955.

New Enthone Distributor in Michigan

Enthone, Inc., New Haven, Conn.,

manufacturer of chemicals and processes for metal finishing, announces the appointment of *Ross Industries, Inc.*, 5890 Commonwealth Ave., Detroit, Mich., as warehousing distributor for Eastern Michigan. With the consummation of this arrangement on September 1, all Enthone chemicals became available at standard prices, F.O.B. the Detroit warehouse.

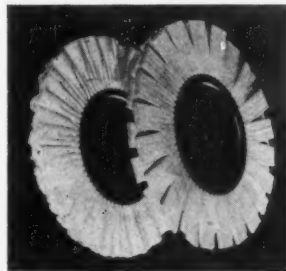
Gilbert Valentine, Enthone technical service engineer, will work with *Ross Industries* and can be contacted through their office.

Ricca and Carlin Get New Pennsalt Assignments

C. Brooks Ricca has been named Philadelphia district sales manager for *Pennsalt Chemicals'* metal processing products, and *James Carlin* has been assigned to the field sales staff.

A graduate of Villanova University, Ricca has been a company representative since 1950 handling sales of its metal cleaners, phosphate coatings and cold forming lubricants for the metal processing industry in New York, Northern New Jersey, Pittsburgh and

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STEEL CENTER!

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A few choice territories are still open.

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CALDWELL, N. J.



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by SAVING BREAKAGE**
with this 12 gal. Semi-hard Rubber
Container for Acids and Bright Dips

- Here's a container made of thick rubber that will outlast stoneware jars or crocks and save you time and money.
- Won't Break or Crack.
- Rugged — Light weight — Easily moved.
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Inside dimensions:

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HOOKS • UZALL ANODE HOOKS • FIBERGLAS TANKS.
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PRODUCTS, Inc.

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in the Philadelphia area prior to his promotion.

James Carlin was educated at Drexel Institute and has been a member of the metal processing products staff since 1947. He was assistant to the manager of sales prior to his present assignment.

News from California

By Fred A. Herr



The Hallenscheid-McDonald Co. of Los Angeles, manufacturers and finishers of bathroom parts and fixtures, recently was taken over by Textron, Inc., of New York and now functions

as the 14th subsidiary of that firm.

No executive and management changes in the Hall-Mak official family

are contemplated, it was announced. The present top-echelon officers remain: *John McDonald*, president; *DeWall McDonald*, vice-president; *Don Bedwell*, general supervisor, and *George "Bud" McDonald*, plant manager.

Bedwell, who for the past two years has been in what he chooses to define as "semi retirement," declined to be pinned down as to when he actually plans to call a close to his four decades of operating in the plating business. Don has been training Bud McDonald as his successor in the general management for several years, a post Don has held since he closed his own shop (DeLuxe Plating Co.) in 1936 to join the Hall-Mak organization. He had been doing business with the company for six years prior to that in the form of providing job shop plating.

"I guess," said Don to METAL FINISHING, "old platers are like General MacArthur's old soldiers. They don't quit or retire, they simply fade away."

James Volheim has joined the staff of Jack Schultz & Co. of Los Angeles

as a sales engineer. Volheim was formerly on the Southern California sales staff of the Carborundum Corp. The Schultz Co. distributes basic chemicals, industrial and institutional cleaning compounds.

Alert Supply Co. has moved from 4755 E. 49th St., Los Angeles, to new and larger quarters at 2041 S. Davie Ave. in the East Los Angeles industrial district.

The new building, a one-story fire-proof structure of 25,000 square feet floor area, provides the firm with 2½ times more area. In addition to modern offices, the building is equipped with increased space for manufacturing buffing compounds, and alkali cleaners which the company will henceforth produce as a licensee of Northwest Chemical Company. Building, land and equipment are reported to represent an investment of \$130,000 to \$150,000.

This supply firm was organized in 1950 by its present operators, who are *Alford E. Perkins*, president, *W. C. Cahill*, vice-president, and *Arthur D. Gaskin*, general manager.



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Richard C. Barrett, president, Barrett Chemical Products, Shelton, Conn., visited California in mid-September as part of a 7,000 mile business trip which he made with Mrs. Barrett to most of the major industrial centers in the mid-west and west between August 12 and September 30. The itinerary included Detroit, Cleveland, Milwaukee, Minneapolis, Seattle, Portland, San Francisco, Los Angeles, Salt Lake, Denver, Kansas City, St. Louis, Pittsburgh, Dayton, and Columbus, Ohio.

In Los Angeles he conferred with Alert Supply Co., his distributors there and, on September 12, addressed Los Angeles Branch of the A.E.S. on nickel plating from sulfamate baths.

U. S. Porcelain Enamel Co., Los Angeles, Calif., has a \$300,000 expansion program underway which includes the installation of a 105 foot furnace reported to be the largest continuous furnace for finishing porcelain in the United States.

Other phases of the program include the purchase of two acres of land adjacent to the present plant at 4635 East 52nd Drive, and a two-story, 6,800 square foot building which is being

equipped as an engineering and administrative department. A new 25,000 square foot warehouse and enlargement of the laboratory are also involved.

Kelite Corp. has appointed Robert J. Racine as western regional manager with headquarters in Los Angeles. Racine was formerly manager of industrial sales for Wyandotte Chemicals Corp., Wyandotte, Mich.

A spectacular fire at the W. P. Fuller Paint Co. plant in the Highland Park section of Los Angeles on August 20 seriously injured one fireman, temporarily incapacitated 20 others, and caused a damage of some \$10,000 to buildings and stock.

The firemen were overcome by fumes generated when the flames and heat exploded a 1,500-gallon container of lacquer and licked at other chemicals in the plant. The fire originated in a mixing room in the lacquer manufacturing department, while workmen were filling one-gallon cans from small drums of lacquer. Static was attributed as the cause that triggered the fire.

Miller Polishing Co., operated at 8103 First St., Paramount, Calif., has expanded its metal polishing operations by the installation of a new 3-foot diameter, four spindle, rotary indexing, automatic polishing machine equipped with three 10 h.p. all angle buffing heads.

The production rate of the machine is reported to be 2,000 pieces per hour, and supplements hand polishers which Miller has used heretofore. Mr. Miller operates a production polishing shop in which the work is devoted chiefly to polishing building hardware and supplies. His six-man plant has been in operation about ten years.

The first two racks of automobile bumpers traveled the entire length of the vast new plating department of the Rheem Automotive Co. at Fullerton, Calif., on August 2nd, marking the final completion and implementation of one of the plating showplaces of Southern California.

Installation of new finishing equipment and moving of hold-over units from the old plant in Los Angeles has been underway for some 2½ months.

The plating facilities truly represent



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VERSATILE — Marla Spray Penetrating Oil is used to free the most corroded bolts, crews, pipe threads, bearings, bushings, pulleys, manifolds, valve guides, locks or any other stuck together metal parts.

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Case of Six—12-ounce Cans \$ 9.00
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an immense project. The cleaning line contains 17 tanks, with 17 stations. Each station has a 4,000 gallon solution capacity, and double stations, which are set up at critical points, have double set-ups. Single stations receive 6,000 amp./12 volt power, while the double cells are equipped with 12,000 amp./12 volts. The double station anodic etch has 30,000 amp./15 volts. The nickel strike setup, at which a two-minute nickel deposit is applied, has 8,000 amp./12 volts.

The plating department is equipped with a double nickel line, each section of which contains 16 tanks of 3,750 gallons nickel solution capacity, powered by 5,000 amp./18 volt rectifiers. Each nickel and chromium tank has separate cathode oscillation, automatic temperature controls, and outside heat exchangers. There is a 4,500 gallon filter on each tank. The chromium line is composed of a single row of ten tanks, eight of which are used for prior cleaning and two for chromium solution. The chromium tanks are of 3,750 gallon capacity, each powered by 20,000 amp./15 volt rectifiers. The installation also includes a rack stripping tank of 3,100 gallons capacity where the chromium is depleted from the contact tips. Four rectifiers furnish the power here. The new Rheem operation is regarded as the largest combined automatic and manually operated plating process in the United States.

Mitchell Raskin, plating superintendent and factory manager for Ajax Mfg.

Co., Los Angeles, a member of Los Angeles Branch of the A.E.S., again has been named to serve as instructor for a course in electroplating being sponsored by the engineering extension division of the University of California at Los Angeles.

The course is being presented under the title of "Science and Practice of Electroplating." Part 1 of what is defined as a two-semester course, began September 9. It will be held once a week on Tuesday evenings from 7 to 9:30 o'clock in Room 708, Hill Street Building in downtown Los Angeles.

The course involves a study of the science, techniques and practices involved in various methods of metal finishing for men already active in that field who wish to broaden their knowledge or brush up on latest developments. Included is the chemistry of plating, plating and cleaning parts, discussion of copper, nickel, chromium and other solutions, analysis, filtering, maintenance of equipment, and health and safety practices applicable to the plating shop.

Other night school courses being offered this fall which have interest for some members of the plating industry, are the following:

"Introduction to Physical Metallurgy," a fundamental study of metals and alloys; "Industrial Waste Disposal," a study of basic factors involved in the effects of industrial wastes; "Synthetic Resins," study of the preparation of synthetic resins, general applications and processing of

phenolics, epoxies, polyesters, silicones, styrenes, polyurethanes, Teflon, and others.

The Electro Metallurgical Co., a division of Union Carbide & Carbon Co. of New York, reports the appointment of R. A. Aeberly as Los Angeles district manager. Aeberly succeeded S. L. Jackson who has been transferred to the New York Office. Aeberly previously had served the company in sales engineering capacities in Chicago.

John K. Gallagher of Long Beach, Calif. has been named California district manager for the Hooker Electrochemical Co. of Niagara Falls, N. Y. H. M. Beaty has been appointed technical sales representative for the company in the Tacoma, Wash., area.

Bralco Metals, Inc., Los Angeles, distributors of aluminum, brass, bronze and copper, recently opened a San Francisco sales office at 288 Seventh Street. Jack Sessions, formerly with Metal Supply Co., is branch manager.

Frank W. Dunn, 56 founder of the Dunn-Edwards Corp., of Los Angeles, died September 9 at Alfa Vista Hospital, Los Angeles. The firm is a manufacturer of paints for industrial finishing and domestic purposes. It was established by Mr. Dunn shortly after he came to Southern California from Illinois 25 years ago.

Planet Anodizing Co., 7902 Woodley Ave., Van Nuys, Calif., reports the appointment of Robert Nance as foreman of plating. Nance was formerly with the Home Plating Co. of Indianapolis, Ind. He plans to transfer his A.E.S. members from Indianapolis to Los Angeles Branch.

Established by Ted Goodman in January, 1956, Planet Anodizing Co. has experienced a phenomenal growth. The firm engages in sulphuric and chromic anodizing, treatment of magnesium and passivating of stainless steel on electronics, aircraft and guided missile parts.

PATENTS

(Continued from page 78)

Vapor Phase Inhibitors

U. S. Patent 2,739,872. March 27, 1956. M. Senkus, assignor to Daubert Chemical Co.

A vapor phase inhibiting composi-



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tion for inhibiting corrosive attack on metal by elements normally existing in the atmosphere comprising, as essential ingredients, an organic amide, an inorganic metal nitrite, and an alcohol having a degree of volatility not greater than that of isopropyl alcohol, said alcohol containing not more than 18 carbon atoms, said ingredients being present in the ratio of about 1 part by weight of said nitrite to 0.05-20 parts by weight each of said amide and said alcohol.

Anodizing Fastener Elements

*U. S. Patent 2,739,931. March 27, 1956.
E. Bernstiel, assignor to Rhondda Plating Works, Ltd.*

An arrangement for anodizing electrically interconnected fastener elements attached to a carrier tape, comprising an electrolytic cell for receiving an anodic bath, the electrolytic cell having an input side and an output side, a rotatable guide roller arranged near the output side of the electrolytic cell, a plurality of further rotatable guide rollers arranged between the said first mentioned guide roller and the input side of the electrolytic cell, a plurality of guides, the said guides and guide rollers being staggered relatively to one another, a drive for rotating at least the said guide roller at the output side of the electrolytic cell so that the tape when trained around the said guide rollers and the said guides is drawn by the driven guide roller to travel around the said guide rollers and the said guides along a substantial zig-zag path from the input side to the output side of the electrolytic cell, and means for scraping fastener element portions lying at one side of the travelling tape.

Plating Chromium on Aluminum

*U. S. Patent 2,739,932. March 27, 1956.
C. W. Forestek.*

A method of electrodepositing chromium on the surface of an aluminum member; comprising the steps of: chemically replacing the oxide film on said surface with a protective coating of zincate to prevent re-oxidation upon contact with the atmosphere; removing said protective coating and simultaneously providing an electrodeposit of chromium, adhered directly to said aluminum surface by electrolysis, of said aluminum member at constant temperature, in a concentrated electrolytic solution including chromic acid and sulfuric acid, said constant tem-

perature being between 90°F. and 120°F. said chromic acid being present in concentrations ranging from 40 to 60 ounces per gallon of solution; and said sulfuric acid being present in concentrations ranging from .40 to .60 ounces per gallon of solution.

Etching Aluminum

*U. S. Patent 2,739,883. March 27, 1956.
K. W. Newman, assignor to Turco Products, Inc.*

A method of etching bodies of aluminum and aluminum base alloys which comprises treating said aluminum bodies with an aqueous alkaline solution which contains citrate ions and alkali hydroxide, said citrate ions being present in a ratio to the alkali hydroxide chemically equivalent to at least about 2.7 per cent of the combined weight of the citrate calculated as citric acid and alkali hydroxide calculated as NaOH, and etching the said aluminum bodies by said treatment and forming a precipitate in said container.

Branch of the American Electroplaters' Society, held on the 13th, was well attended considering that the summer sessions are non-technical business meetings.

Considerable time was spent discussing ways and means of increasing attendance at the regular meetings. It was the feeling of the group that more operating men could be interested in the Society if the topics of discussion were made as practical as possible. Several new ideas along this line will be tried during the coming winter season, the success of which will be reported at a later date.

H. A. Gilbertson reported that he is making good progress on the history of the Chicago branch which he is writing. Everyone is anxiously waiting for this project to be completed.

*Joseph Corre,
Publicity Chairman*

Philadelphia Branch

Papers for the Philadelphia Branch annual educational session at The Benjamin Franklin hotel, Saturday, October 20 will feature: "Mechanism of Corrosion of Plated Coatings" by Dr. Harold J. Read, Professor of Physical Metallurgy, Pennsylvania State University; "Double Layer Nickel Coatings—Corrosion Behavior and Protective Value" by Clarence H. Sample, Development and Research Division, International Nickel Co.; and a paper on supplemental treatments of nickel-

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

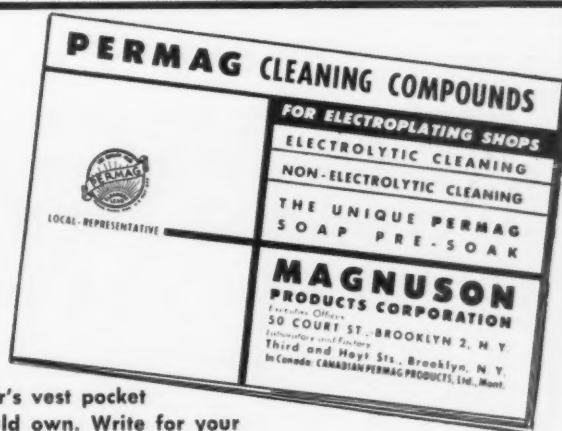
Chicago Branch

The July meeting of the Chicago

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chromium coatings to improve protective value.

The educational session, under the direction of *Dr. A. Kenneth Graham*, president of Graham, Crowley & Associates and former AES executive secretary, will start at 2:00 PM. The banquet, followed by a show and dance, will get under way at 7:00 PM. Tickets are \$7.50 a person and may be obtained in advance from Ticket Chairman *Robert L. Farren, Jr.*, Aetna Electroplating Co., 7770 Dungan Rd., Philadelphia 11, Pa.

I. Wm. Marcovitch
Publicity Chairman

Central Michigan Branch

The Central Michigan Branch opened their 1956-57 season with the annual stag golf outing at Arbor Hills Country Club in Jackson, Mich. The exceptional turnout of 138 members and guests enjoyed the full day's program of lunch, golf, and dinner.

Earl D. Creese,
Publicity Secretary

Chicago Branch

The regular meeting of the Chicago Branch was held August 10, 1956. The meeting was called to order promptly by *Dr. Russel Harr*. Plans to make the fall and winter technical sessions more interesting and attractive were discussed at some length. Librarian, *Scott Modjeska* reported that arrangements for programs through the month of February have been completed. He also reported that *E. H. McCoy* will discuss

the operation of bright copper plating solutions at the September meeting.

The membership committee reported that a membership drive will be under way starting early this fall.

It was the pleasure of those present to celebrate with *Rudy Hajucha* the completion of his 42nd year of perfect attendance at all branch meetings.

J. C. Corre,
Publicity Chairman

Los Angeles Branch

A talk on "Nickel Plating from the Sulfamate Bath" by *Richard C. Barrett*, president of Barret Chemical Products, Shelton, Conn., featured the educational session of Los Angeles Branch on September 12 when the chapter resumed meetings after a two months recess in July and August.

Mr. Barrett first presented some historical background of the process. Thereafter he described the solution, stating that any description of sulfamate plating baths must necessarily start with a discussion of the unique properties of sulfamic acid and its salts. A question-and-answer period was conducted after Mr. Barrett had completed his address.

The Branch's first fall meeting drew an attendance of close to 100 members and guests. President *J. Truman Stoner* presided and officiated at the initiation of six members, who were: *Edward L. Riggs*, Menasco Mfg. Co.; *Mrs. Vonna F. Ott*, owner of Product Engineering Service, Pasadena, the branch's only distaff member; *Dr. Joseph S. Smatko*, of the chemical engineering depart-

ment, University of Southern California; *Downey Morgan*, A&A Metal Finishing Co.; *Andrew A. Carroll*, Recordizing Corp.; and *Roy Webb*, Oakite Co. The applications of 12 others were received and referred to the board of managers for processing.

Stuart Krentel presented a report on the national convention in Washington and officially advised the membership that the 1960 A.E.S. convention had been awarded to Los Angeles. In order to get the ball rolling early, and to back up Krentel's promise at Washington that Los Angeles proposed to sponsor the greatest convention in A.E.S. history, Branch President Stoner appointed *Tony Stabile* as general chairman of the 1960 convention committee, with *George Hetz* as co-chairman.

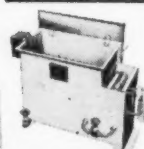
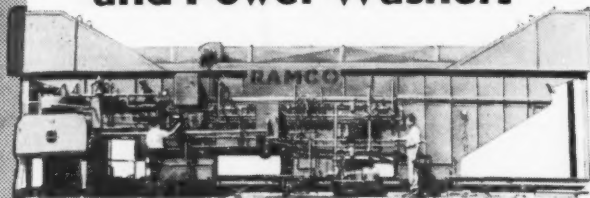
Don Bedwell, general superintendent of the Hall-Mak Co., and a plater for four decades in Southern California, was then called to the rostrum and presented by Stoner with the button of honorary membership which was accorded him at the Washington conclave.

Harvey Hunt reported on the progress of arrangements for the branch's 1957 annual educational session. The choice of site lies between the Ambassador and Statler Hotels, with a decision to be made shortly. Hunt announced a meeting of the general committee would be held the following week to map preliminary plans.

The deaths of *George Hunter*, formerly Southern California manager for the F. L. and J. C. Codman Co. of Rockland, Mass., and *George L. Slomin*, head of George W. Slomin & Associates, Los Angeles testing and research laboratories were announced.

Guests at the September 12 meeting included: *Walter F. Zunell*, Rocketdyne Corp.; *Robert Nance*, Planet Anodizing Co.; *James Volheim* and *Gene Schwegel*, Jacks Products; *Richard Haner*, Plating, Inc.; *Roy Stevens*, Consolidated Electro-Deposits; *George Dufour*, Convair, Pomona; *Robert Schwartz*, Cal-Pacific Chemical Co.; *Roy Webb*, Oakite; *Robert Mintz*, Atlas Plating Co.; *J. R. Russell*, Turco Products; *Richard Booth*, Wyandotte Chemicals Co.; *Elliott Miller* and *Burt Water*, Kelite, Inc.; *Walter Cole*, Delco Chemicals; *Jack Hunter*, Hightower Plating Co.; *Russ Davis*, Hanson-Van-Winkle-Munning Co.; and *Carl Larson* and *William Beesom*, Hal-Mak Co.

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THE AMERICAN SOCIETY FOR METALS

A California university professor and a Canadian aluminum scientist were nominated to fill the two top offices of the American Society for Metals for the 1956-1957 term.

Nominated for president was *Dr. Donald S. Clark*, Professor of Mechanical Engineering, California Institute of Technology, Pasadena, Cal., currently serving as vice-president. For vice-president, the committee went to Montreal, picking *George M. Young*, technical director of The Aluminum Co. of Canada. Retiring president is *A. O. Schaefer*, director of Research, Midvale-Heppenstall Co., Philadelphia who automatically becomes a member of the Board of Trustees. As treasurer, *C. H. Lorig*, assistant director, Battelle Memorial Institute, Columbus, Ohio, continues into his second year.

Two new Trustees were picked by the Society's Board. They are *George A. Fisher, Jr.*, St. Louis, Mo., manager, Research and Development Div. (St. Louis section), International Nickel Co., Inc., and *Carl E. Swartz*, consulting metallurgist, Hinsdale, Ill.

As secretary of the Society *W. H. Eisenman*, Cleveland, Ohio, was selected for his 20th two-year term by a special committee comprised of past presidents of the Society. Eisenman has been directing secretary for 38 years building the ASM from an original 200 members to its present world-wide position with 26,432 members in 96 Chapters.

THE ELECTROCHEMICAL SOCIETY, INC.

Future Meetings

May 12, 13, 14, 15, and 16, 1957—Washington, D. C. Headquarters at the Statler Hotel. Sessions probably will be scheduled on Electric Insulation, Electronics (including Luminescence, Semiconductors, Oxide Cathodes, Instrumentation, and possibly Screen Applications), Electrothermics and Metallurgy, Industrial Electrolytics, and Theoretical Electrochemistry (including a special symposium on electrolytes).

October 6, 7, 8, 9, and 10, 1957—Buffalo, N. Y. Headquarters at the Statler Hotel.

April 27, 28, 29, 30, and May 1, 1958—New York, N. Y. Headquarters at the Statler Hotel.

September 28, 29, 30, October 1,

and 2, 1958—Ottawa, Ont., Canada. Headquarters at the Chateau Laurier.

Spring 1959—Philadelphia, Pa. Further information to be announced later.

Fall 1959—Columbus, Ohio. Headquarters at the Deshler-Hilton Hotel. Further information to be announced later.

May 1, 2, 3, 4, and 5, 1960—Chicago, Ill. Headquarters at the Lasalle Hotel.

October 9, 10, 11, 12, and 13, 1960—Houston, Texas. Headquarters at the Shamrock Hotel.

Spring 1961—Knoxville, Tenn. Further information to be announced later.

Fall 1961—Detroit, Mich. Further information to be announced later.

National Chemical Exposition Calendar of Events

The 9th National Chemical Exposition to be held in Cleveland Public Auditorium, Cleveland, Ohio, November 27-30, 1956 will offer trade show, technical programs and special features.

A trade show of the entire chemical industry is co-sponsored by the Cleveland and Chicago Sections of the American Chemical Society. Technical sessions on "New Chemicals for Industry" are arranged by the ACS; "Chemical Safety" and "Chemical Process Equipment Standardization" by the Manufacturing Chemists Association, and the "I&EC Lecture Series" by the editors of Industrial & Engineering Chemistry.

Special features are Trail Blazers of Chemistry; Art Exhibit by Chemists

(4th International); Photographic Salon (for chemists); book exhibit.

Special exhibit: by the Chemical Corps of the U. S. Army,—"Chemistry in Defense."

N. A. C. E.

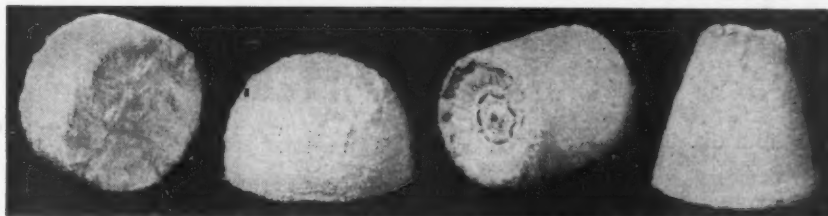
The National Association of Corrosion Engineers announces a North Central Regional meeting is to be held at the Statler Hotel in Detroit, November 15-16, 1956.

This is the first full meeting of the more than 1,000 members of this region. With more than 100 members in Detroit and others coming from the region bounded on the west by Montana and Wyoming, on the south by Missouri and on the east by Ohio, an attendance of several hundred is expected.

The conference headed by *Walter Cavanaugh*, of Parker Rust Proof Co., general chairman, will include speakers of authority and discussions of corrosion in four business fields — Automotive, Utilities, Chemicals and Construction.

Among the papers to be presented at the technical sessions are: "Surface Treatments for Metals in the Construction Industry," by *J. F. Hirshfield*, The Hinchman Corp.; "Accelerated Corrosion Tests for Plated Coatings," by *W. L. Pinner*, Research and Engineering Div., Houdaille Industries; and "The Role of Finishing in the Prevention of Automotive Body Corrosion" by *E. L. Leithauser*, Research Staff, General Motors Corp.

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NACE Western Region to Meet at Long Beach, Cal.

Preston W. Hill, Signal Oil and Gas Co., Long Beach, Cal. has been named general chairman of the 1956 Fall Meeting of National Association of Corrosion Engineers Western Region. The meeting will be held November 15-16 at the Lafayette Hotel. R. E. Hall, Union Oil and Gas Co., Brea, Cal. is program chairman.

AMERICAN SOCIETY FOR TESTING MATERIALS

A symposium on properties, tests and performance of electrodeposited metallic coatings was one of the features of the Second Pacific Area national meeting and apparatus exhibit of the ASTM at the Hotel Statler, Los Angeles, Calif., September 17 to 21.

The most comprehensive program ever attempted by the Society was scheduled in the form of more than 200 papers offered at 43 technical sessions at which the latest research and the results therefrom in the field of materials were discussed.

Of primary interest to platers was the all day symposium on electrodeposited metallic coatings held in morning and afternoon sessions on September 19. A panel discussion along similar lines held under ASTM sponsorship in Buffalo, N. Y., in February, 1956, had been so successful, it was announced, that a repeat performance was scheduled at Los Angeles. Letters of invitation to attend had been sent by Past-President W. L. Pinner of the *American Electroplaters' Society* to members of A.E.S. branches in Los Angeles, San Francisco, Portland, Ore., and Seattle, Wash.

The Metallic Coatings Symposium presented the following speakers and subjects:

"History of ASTM Committee B-8," by Dr. William Blum, retired, formerly director of the chemistry section, National Bureau of Standards.

"Corrosion Behavior & Protective Value of Decorative Copper-Nickel-Chromium and Nickel-Chromium Coatings on Steel," by C. H. Sample, International Nickel Co.

"Evaluation of Methods Available

for Measurement of Surface Luster of Electroplated Coatings," by Glade Bowman of Standard Steel Spring Div., Rockwell Spring and Axle Co.

"Metal Cleaning Prior to Electroplating," by S. Spring of Kelite Corp. "Radioactive Isotope Dilution Method for Determining Sulfate Concentration in Chromium Pating Baths," by L. O. Gilbert, Rock Island Arsenal. The September 19, afternoon session, presented the following subjects: "Phosphate Coatings Over Zinc Plated Parts," by A. L. Alexander, Naval Research Laboratory.

"Comparison of the Corrosion Behavior and Protective Value of Electrodeposited Zinc and Cadmium Coatings on Steel," by C. H. Sample and R. B. Teel, International Nickel Co., and A. Mendizza, Bell Telephone Laboratories.

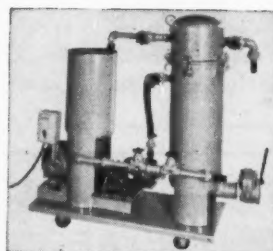
"Evaluation of Supplementary Coatings," by R. E. Harr, Western Electric Co. "Atmospheric Exposure of Electroplated Lead Coatings on Steel," by A. H. Du Rose, Harshaw Chemical Co.

"The Standard Salt Spray Test — Is is a Valid Acceptance Test," by A.

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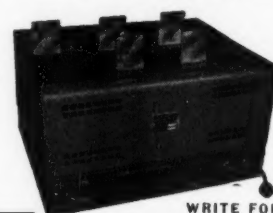


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An exhibit held in conjunction with the conference featured displays of 25 organizations and firms concerned with testing and scientific apparatus.

Manufacturers' Literature

Grinding-Polishing Wheel

Mermac Products Corp., Dept. MF, 515 N. Racine Ave., Chicago 22, Ill.

A four-page, illustrated booklet describes the E-Z-Kut wonder wheel for polishing and grinding, giving its advantages and recommended belt sizes for each wheel and speed.

Additional information and copies of the booklet may be obtained from the above manufacturer.

Aluminum Cleaners

Northwest Chemical Co., Dept. MF, 9310 Roselawn Ave., Detroit 4, Mich.

A four page brochure has been issued by the above firm giving a de-

scription of some of their aluminum cleaners. Also included is an outline of the system for preparing aluminum for welding, and variations of the cleaning process.

Automatic Plating Machines

The Udylyte Corp., Dept. MF, Detroit 11, Mich.

The above firm has issued a four page brochure on its full automatic plating machines. Listed are twelve advantages of the machines, as well as many drawings illustrating variable rack spacing, and operating advantages.

Plating Test Equipment

R. O. Hull & Co., Inc., Dept. MF, 1306 Parsons Court Rocky River 16, Ohio.

A new eight-page brochure describes Rohco test equipment for plating baths. Of particular interest to production platers and methods engineers is the complete line of instruments and accessories for laboratory and plating tank testing.

Among the devices described are Hull Cell miniature plating test units for control of plating baths including anodes and cathodes; hanging cell for making plating tests under production conditions; electric cell agitator, for reproducing tank operation; rectifiers for cell tests; Currentester, for detecting and correcting hidden troubles of rectifiers to maintain highest quality production, etc.

Filter Pumps

Sethco Mfg. Co., Dept. MF, 70-78 Willoughby St., Brooklyn 1, N. Y.

Newly designed filter pumps for highly corrosive solutions are described in an eight page bulletin. Specific filtration equipment is described for solving special problems.

Photographs in the Bulletin 102 show pumps in action. Complete price sheets are enclosed.

Electric Motors

General Electric Co., Dept. MF, Schenectady 5, N. Y.

Bulletins GEC-1026A and GEC-1027A, each 11 pages, give buying information on a selected group of

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Chemical Feeders and Mixers

Infilco Inc., Dept. MF, P.O. Box 5033, Tucson, Ariz.

"Chemical Mixers and Feeders" is the title of a new bulletin, No. 350-E, which has just been published. It is an 8-page brochure, with numerous illustrations and diagrams. The bulletin includes descriptions and performance data on mixers and feeders.

Precision Barrel Finishing

Speed-D-Burr Corp., Dept. MF, 3613 San Fernando Road, Glendale, Calif.

Comprehensive in coverage, these catalogs explain in detail, with many illustrations, the many types of equipment available to manufacturers who plan the use of barrel finishing as a plant operation.

An overall understanding of the cost reductions possible using barrel finishing equipment over other finishing methods will be obtained from the folder *How to Reduce Production Costs 80% Or More*. A catalog on the

Futurama line pictures the streamlined line most adaptable to large, high production work needs. Another popular line, the Mity-Mite, is also available in catalog form, well illustrated.

As an adjunct to the necessary barrel finishing equipment, a complete line of Media and Compounds, showing a wide variety of grades, grits and sizes is available under that catalog name. Slip-sheets covering Handling Equipment and other special units are also offered.

Phosphate Conversion Coatings

Turco Products, Inc., Dept. MF, 6135 S. Central Ave., Los Angeles 1, Calif.

A detailed phosphating folder covers the entire Turcoat line of phosphating and metal protective coating materials.

A portion of this folder is devoted to a general discussion of phosphating. Included in this portion are diagrammatical cross-sections of how phosphating works, application photographs and a discussion of the use of coating materials as bonds for paint, as bonds for other organic finishes, as anti-friction coatings and as agents to protect unfinished metals from corrosion.

Also featured is a valuable phosphating reference chart, which describes the purpose and make-up of each type of coating, recommended uses, applicable government specifications, methods of application, equipment requirements, metals that can be coated, coating weights and basic operational cycles.

Sodium Orthosilicate

Chlor-Alkali Sales, The Dow Chemical Co., Dept. MF, Midland, Mich.

A new 8 page booklet of special interest to the metal cleaning industry, entitled "Dow Sodium Orthosilicate,"

discusses various metal cleaning applications of the chemical and concisely presents physical and chemical properties, packaging and safety precautions.

Sections on electrolytic and spray cleaning in the metal cleaning field point up advantages of the chemical. Dip and soak cleaning is also reviewed.

Surface Preparation of Steel

Lead Industries Assn., Dept. MF, 60 East 42nd St., New York 17, N. Y.

"Red Lead Technical Letter No. 11—Recommended Surface Preparation of Steel for Red Lead Paints" is the first of a series of red lead technical letters to deal with surface preparation of steel prior to the application of primer paints. Previous technical letters confined themselves to recommended red lead primer formulations.

In addition it contains a handy quick reference table indicating the recommended surface preparation methods for specific types of steel structures, red lead primers, exposure conditions and drying times.

Control of Magnesium Alloy Dust and Fumes

Peters-Dalton, Inc., Dept. MF, 17900 Ryan Road, Detroit 12, Mich.

A new brochure, "Wet Method is Best," fully describes methods of col-

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lecting and controlling magnesium alloy dust and fumes which, among other metals, can create hazards during processing operations when improperly handled. Illustrated in a most interesting fashion, this handy, eight-page brochure can readily be used as reference literature by plant executives and managers of metal working plants as well as factory personnel who directly machine or found metals of magnesium alloys.

Wide in scope, this brochure informs the reader in precise and easy-to-understand terms of the safe, efficient, and economical methods of protecting plants and foundries against the possible hazards that can occur while processing magnesium. In addition, it thoroughly describes the design and operation of several dust and fume collection systems.

Brush Finishing with Centerless Grinders

The Osborn Mfg. Co., Dept. MF, Cleveland, Ohio.

Getting double duty from centerless grinding machines is explained in a new, four-page brochure, illustrated with photographs and a brush specifications chart. It tells how to reduce downtime on centerless grinders by extending their use to precision brush finishing on cylindrical parts. Types of finishing possible, and characteristics of brushes needed, are described.

Aluminum Alloy

Kaiser Aluminum & Chem. Corp., Consumer Service Division, Dept. MF, Room 1056, 1924 Broadway, Oakland 12, Calif.

An eight-page booklet containing up-to-date information on the above firm's aluminum alloy 5005 describes the various characteristics and outlines its advantages in superior finishability, anodizing qualities and in-service appearance as compared with alloy 3003 for many applications.

Engineering data are presented in the booklet, along with a table showing the alloy's availabilities in sheet and plate.

Bronze Globe Valves

Lunkenheimer Co., Dept. MF, Box 360, Cincinnati 14, Ohio.

A new, four-page, three-color detailed circular, No. 602-2, on the two pressure classes of LQ600 bronze globe valves, for a wide variety of services

from normal to exceptionally severe, lists all features of each pressure class, and describes and includes the ASTM, ASME, and military specification numbers of the exclusively-developed alloy used for the bodies and bonnets.

Process Equipment

U. S. Hoffman Machinery Corp., Industrial Div., Dept. MF, 103 Fourth Ave., New York, N. Y.

A new 4-page folder lists and describes blowers, exhausters, pneumatic systems, filters, flotation equipment, separators, stills, smooth-flow tubular pipe and fittings, and the Hoffco-Vac vacuum cleaners for industrial use.

The folder provides a quick and ready reference for plant engineers and designers.

Drum Rotators

Morse Mfg. Co., Inc., Dept. MF, 727 West Manlius St., East Syracuse, N. Y.

Ways to cut mixing, blending, tumbling and cleansing costs are featured in the new Bulletin 355. The bulletin describes six major models of the complete portable and stationary drum rotator line, manufactured by the company.

Wet Blasting Applications

The Cro-Plate Co., Inc., Dept. MF, 747 Windsor St., Hartford 1, Conn.

A series of a fully illustrated folders describing in detail a variety of applications for the Pressure Blast wet blast-

ing process are now available. The material deals with deburring, selection of abrasives, finishing of molds and dies, honing cutting tools, carbide inspection, cleaning prior to electroplating, aircraft engine overhaul cleaning, etc.

Chemical Feeder

Infilco Inc., Dept. MF, P.O. Box 5033, Tucson, Ariz.

"Neusol" Feeder Bulletin No. 340-A on chemical feeding equipment for use in the treatment of waters and wastes has just been published. It is attractively printed in two colors with illustrations and diagrams.

Manufacturers' Directory

The 21st annual edition of The Directory of New England Manufacturers is now available, at \$40 per copy. The book is divided into four sections — alphabetical, geographical, product and brand name — in one 776 page volume.

Copies of the Directory are available from the George D. Hall Co., 20 Kilby St., Boston 9, Mass.

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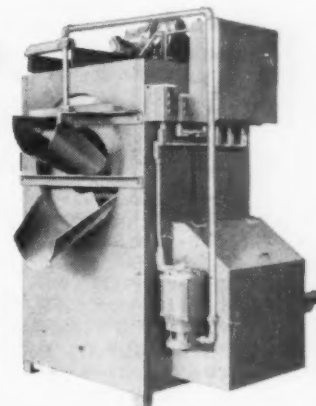
Mathewson Machine Works, Inc., Dept. MF, 80 Hancock St., Quincy 71, Mass.

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500/250	6/12	Elec. Prod.
500	25	Elec. Prod.
750/375	6/12	Excel
940	32	Elec. Prod.
1500	15	Star
1500	30/50	Century
1500	40/65	G. E.
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- 1—6000/3000 Ampere, 6/12 Volt, Electric Products, Synch.
- 1—3000/1500 Ampere, 12/24 Volt, Chandeysson, Exc-in-head.
- 1—2500/1250 Ampere, 9/18 Volt, Electric Products, Synch., Exc-in-head. 25°C.
- 1—2000/1000 Ampere, 6/12 volt, Hanson-Van Winkle-Munning.
- 1—2000/1000 Ampere, 9/18 Volt, Electric Products.
- 1—1500/750 Ampere, 12/24 volt, Chandeysson, Synch., Exc-in-head.
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42" long
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Puro zinc
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PESCO PLATING EQUIPMENT CORP.

75 Wythe Ave. Brooklyn 11, N. Y.
Evergreen 4-7472-3-4

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TREMENDOUS SAVINGS

All items in very good condition, complete with exhaust systems and electrical equipment.

- 1—Packermatic 1952 \pm 3 straight line, automatic sheet polisher, 14" x 34" movable column, reciprocating head.
 - 1—Harper 1952 continuous or automatic indexing, 4 polishing heads, 96 ball bearing stations on 3" centers.
 - 1—Harper 1953 continuous or automatic indexing, 4 polishing heads, 84 ball bearing station on 4" centers.
 - 1—Packermatic automatic indexing 30" table, 5 stations on 13" centers.
 - 1—Acme L4, 4 station semi-automatic indexing.
 - 2—Continuous 8 station coloring machines.
- Call LO 2-9508 for appointment to see equipment.
Address: October 9, care Metal Finishing,
381 Broadway, Westwood, N. J.

COMPLETE PLATING UNIT FOR SALE

With chemicals for bright zinc. 90' long. Runs automatically on link belt chain track. 13' high return track. With two 6 volt 1500 Amp. Crown rectifiers and 1000 gallon per hour stainless steel filtering unit. Steam provided by oil fired 40 horsepower low pressure boiler. Zinc tank 22' long. All tanks 3' wide, 4' deep. Also one barrel and tank complete with Crown spin dryer. Two extra large rubber lined cleaning tanks. Can be seen in operation. Replacement price \$45,000. Sale price \$15,000. Address: October 2, care Metal Finishing, 381 Broadway, Westwood, N. J.

QUALITY EQUIPMENT PRICED RIGHT AND READY FOR IMMEDIATE SHIPMENT

BUFFING & POLISHING EQUIPMENT

100 Hammond — Divine — U. S. Electric — Holland — Standard Electric — L'Hommiedieu single speed and variable speed buffing and polishing machines. 1 HP to 20 HP.

6 Rotary Machines: Hammond — Acme — Packermatic.

Complete buffing systems for above machines, consisting of hoods, cyclones, dust boxes, pipes, motors & blowers; various sizes.

Semi-automatic machines: Buffalo — Hammond — Acme — Divine — Production

Hundreds of other buffing & polishing items used in buffing and polishing plants.

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20 Gas fired soft metal and unbreakable METAL CASTING POTS with fume removing hoods, heating thermometers, fume removing blowers and motors.

Gas fired, steam boilers. Mears-Kane-Ofeldt — from 1 to 20 H.P. and pump systems.

SPRAYING EQUIPMENT

25 Spray Booths, various sizes, filters, Vapor Proof Lights, Paint Storage Cabinets, Fans, Motors, Hose, Guns, etc.

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100 MOTOR GENERATOR SETS VARIOUS SIZES

CHANDEYSSON: 1000 amps. to 5000 amps. & larger.

HANSON VAN WINKLE MUNNING: 2000 amp.

HOBART: 2000 amp.

COLUMBIA: 1000 amps. to 4000 amps.

BOGUE ELECTRIC: 2500, 3000 amp.

AMERICAN GIANT: 2500 amp.

ANODIZERS: 5 to 40 Volts: 500 amps. to 2000 amps.

All above complete with motors, panel board, starting equipment; all separately excited, interpole type.

PLATING EQUIPMENT

30 Plating Barrels: Crown — Udylite — HVWM — various sizes.

1 HVWM Semi-Automatic Rubber lined Plating Unit: 33' long, 3 1/2' wide, 3' deep with Reeves Variable Speed Drive and Movable Agitator.

6 Semi-Automatic Plating Tank Units: Udylite 20' — HVWM 20' — Crown 35' — U. S. Galvanizing 12', 16' and 20'.

1 HVWM 4 station Plating Barrel Unit: 36x14; rubber lined tank, rubber cylinders.

40 Chrome Plating Tanks: 2' to 20' long lead lined with tank rheostats, rods, fume ducts, lead heating coils.

175 Plating, Rinsing, Cleaning Tanks: assorted: wood, steel, lead lined, rubber lined. All sizes 2' to 16' long.

150 Rheostats & Switches, assorted: 50 amps. to 2000 amps. All makes HVWM, Crown, Columbia, Holland, Udylite.

10 Centrifugal Dryers: acid crocks, motor driven exhaust fans, fume blowers, complete acid and dip rooms, cleaning and washing tanks, plating racks and many other items.

30 Rubber lined Nickel Plating Tanks: 2' to 12' long; with rods, rheostats, motor driven tank rod agitators, heating coils, etc.

1 Rotary Industrial Washing Machine, for small parts, mfgd at New Brunswick, N. J. 20' long with rinsing, washing and cleaning sections, 3' wide, 3' high with motor pumps, blower & rotating cylinder. Type PD-18-WRD, with temperature controls & starting equipment.

16 Detrex, Blakeslee, Circo, Steam, Gas and Electrically Heated Degreasers: 3' to 6' long, single dip and 3 dip type, with pumps, tanks, fume ducts.

12 Steiner Ives and Gehrnich Paint Baking and Drying Ovens: electric, all sizes; full automatic, recirculating type with controls, fans, blowers.

ALL SIZES OF REBUILT RECTIFIERS: from 10 Amp. to 6000 Amp. — complete range of sizes.

ALL SIZES — TUMBLING BARRELS: Abbott — Baird; complete with stones and steel balls.

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- 1—Richardson Allen 500 amperes 0-6 volt Rectifier w/remote control.
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- 2—Baird 1/2 C Tilting Tumblers w/wooden or steel tubs.
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Rectifiers — 25 Amperes to 10,000 Amperes

Airbuffs — Compounds — Anodes — Chemicals, etc.

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Busy plating shop in excellent industrial area. Will consider partner with capital. Complete shop reasonably priced. Address: October 1, care Metal Finishing, 381 Broadway, Westwood, N. J.

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Exceptional value — automatic polishing machine. New 1953; never used in production. Divine RLX 8 station rotary; 3-7 1/2 hp floating heads; air lifts, compound applicators, hoods; all J.I.C. wiring, operator control pedestal. Machine can be demonstrated. Address: October 3, care Metal Finishing, 381 Broadway, Westwood, N. J.

WANTED USED BUFFING WHEELS

Any Type — Any Quantity.

S. J. WILLIAMS

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5000/6000 Amp. 6/12 volt generator (used).

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lon heating, 320,000 BTU cooling

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lon heating, 160,000 BTU cooling

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- 10—Sump Pumps 1 HP to 7 1/2 HP
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- 10—1/2 & 1 HP Boston ratio motors for oscillation motions
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- 30—Automatic Machine Co. Oscillating single spindle, semi-automatics, Lefts & Rights.
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 - 3—Divine Polishing Machines 5, 7 1/2 & 10 H.P.
- Send for complete listing of polishing machines available. New 5 H.P. Lathes \$350., New 7 1/2 H.P. Lathes \$395.

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- 2—Production Tube Polishing #101, up to 8" tubing.
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- 2—Globe Tilting Type 3/4 H.P.
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SITUATION OPEN — Distributors, jobbers and manufacturers agents wanted to distribute and sell the full line of Schaffner's polishing and buffing composition in bar, spray or paste form, and a complete line of polishing room supplies.

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Position is permanent with old established, progressive, independent company. Good starting salary. Excellent Company benefits. Excellent living conditions available in western Connecticut.

To obtain appointment for interview reply in writing, stating age, education, experience, and present salary requirements. All replies confidential. Address: October 4, care Metal Finishing, 381 Broadway, Westwood, N. J.

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SALESMEN WANTED BY THE JACKSON BUFF CORPORATION

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Crown Rheostat & Supply Co. 3465 N. Kimball Ave., Chicago 18, Ill.	11	Manderscheid Co., The 212 So. Clinton St., Chicago 6, Ill.	122	Ther Electric & Machine Works 19 So. Jefferson St., Chicago 6, Ill.	96
Davies Supply & Mfg. Co. 4160 Meramec St., St. Louis 16, Mo.	110	Manhattan Rubber Div., Raybestos-Manhattan, Inc. 6 Willett St., Passaic, N. J.		Thermo-Panel Div., Dean Products, Inc. 1042 Dean St., Brooklyn 38, N. Y.	106
Davis-K Products Co. 135 W. 29th St., New York 1, N. Y.	92	McAloer Manufacturing Corp. 101 S. Waterman Ave., Detroit 17, Mich.	6	Tranter Mfg., Inc. Lansing 4, Mich.	18
Diamond Alkali Co. 300 Union Commerce Bldg., Cleveland 14, Ohio	20	Mermac Products, Inc. 515 N. Racine Ave., Chicago 23, Ill.	31, 45	True-Brite Chemical Products Co. P. O. Box 31, Oakville, Conn.	111
Dixon & Rippel, Inc. Box 116, Saugerties, N. Y.	116	Metal & Thermit Corp. Rahway, N. J.		Udylite Corp., The Detroit 11, Mich.	94, 95
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Du-Lite Chemical Corp. Middletown, Conn.		Michigan Buff Co. 3503 Givrol Ave., Detroit 12, Mich.	10	U. S. Galvanizing & Plating Equipment Corp. 31 Heyward St., Brooklyn 11, N. Y.	50
Du Pont de Nemours & Co., E. I. Wilmington 98, Del.	23, 37	Michigan Chrome & Chemical Co. 8615 Grinnell Ave., Detroit 13, Mich.		U. S. Stoneware Co. Akron 9, Ohio	21
Electro-Gleam, Inc. 1075 Clinton St., Buffalo 6, N. Y.	124	Mitchell-Bradford Chemical Co. Wampus Lane, Milford, Conn.		Universal Foundry & Machine Co. 14841 Meyers Rd., Detroit 27, Mich.	40
Electronic Rectifiers, Inc. 2102 Spann Ave., Indianapolis 3, Ind.	108	Motor Repair & Mfg. Co., The 1555 Hamilton Ave., Cleveland 14, Ohio	126	Wagner Brothers, Inc. 418 Midland, Detroit 3, Mich.	47
Enthane, Inc. 442 Elm St., New Haven 11, Conn.	3	Murray-Way Corp. P. O. Box 180, Maple Rd. E., Birmingham, Mich.		Walker Div., Norma-Hoffman Bearings Corp. Stamford, Conn.	38
Federated Metals Div., American Smelting & Refining Co. 120 Broadway, New York 5, N. Y.	77	Mutual Chemical Div., Allied Chemical & Dye Corp. 99 Park Ave., New York 16, N. Y.	8	Wallace & Tiernan Co., Inc. 25 Main St., Belleville 9, N. J.	16
Finger Lakes Chemical Co. Etna, N. Y.		National Aluminate Corp. 6297 W. 66th Place, Chicago 38, Ill.		Wyandotte Chemicals Corp. Wyandotte, Mich.	
Forbes, W. D. 129 Sixth Ave., S.E., Minneapolis 14, Minn.		National Research Corp. 70 Memorial Drive, Cambridge 42, Mass.	107	Zialite Corp. 92 Grove St., Worcester 5, Mass.	
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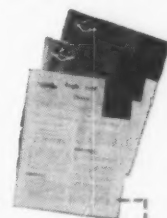
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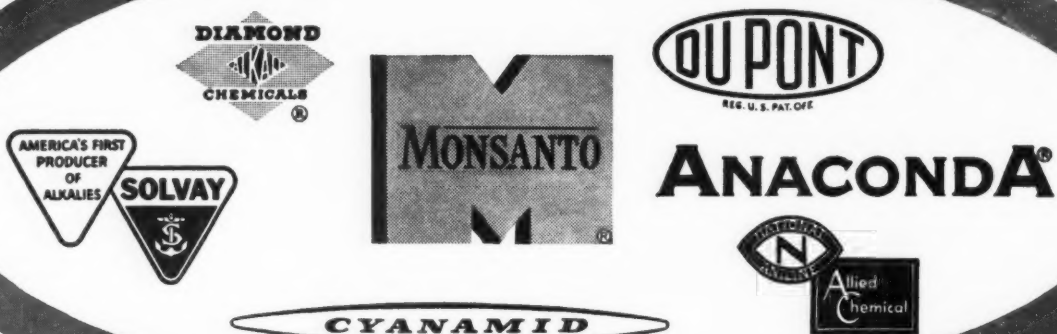
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